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1. INTRODUCTION

1.1 Purpose

This study and its supporting analyses and documentation was developed to provide in-depth information regarding the development of route designations for the through transportation of highway route controlled quantity shipments of radioactive materials in the State of California.

Section 33000 of the California Vehicle Code mandates the California Highway Patrol to adopt regulations necessary to implement the routing of highway route controlled quantity shipments of radioactive materials. The federal government has established all interstate highways as approved routes; the Department of California Highway Patrol is proposing to designate only those routes necessary for through transportation.

1.2 Study Structure

This study contains a discussion of the route risk assessment methodology employed by the California Highway Patrol, a description of the HazTrans® routing and risk management software program, a review of the highway route controlled quantity shipments of radioactive materials flow data, gathered from the "Highway Route Controlled Quantity Shipments of Radioactive Materials Transportation Survey", a discussion of primary and secondary risk assessment factors, and an analysis documentation for each through route identified for the transportation of highway route controlled quantity shipments of radioactive materials. An overview of federal and State regulations, and a legislative history of radioactive materials routing in California is also provided.

1.3 Legislative History

1959 Sections 33000 and 33001 were added to the California Vehicle Code in September 1959. Section 33000 defined "Radioactive Materials" for the purposes of the California Vehicle Code. Section 33001 provided that the State Fire Marshal may adopt regulations that may promote the safe transportation of radioactive materials.

1961 In September 1961, Section 25651 was added to the Health & Safety Code. This Section provided that the California Department of Health Services

shall adopt regulations to promote the safe transportation of radioactive materials. The Section also included a provision that the regulations may include routes. Section 33000, California Vehicle Code was amended to require that the transportation of radioactive material comply with the provisions of the Health & Safety Code. Section 33001, California Vehicle Code relating to the State Fire Marshal's authority to adopt radioactive material regulations was repealed.

1981 In January 1981, Section 33000, California Vehicle Code and Section 25651, Health and Safety Code were amended. These Sections provided that the California Highway Patrol shall adopt regulations specifying the routes to be used for the transportation of hazardous radioactive materials, as such materials are defined in regulations of the California Department of Health Services.

1991 In January of 1991, the California Department of Health Services amended Title 17, Section 30100, California Code of Regulations defining "hazardous radioactive material" as "highway route controlled quantity" of radioactive materials, as defined in Title 49, Section 173.403, Code of Federal Regulations.

1.4 Definitions

- "Highway Route Controlled Quantity" - Defined in Title 49, Section 173.403 (l), Code of Federal Regulations as a quantity within a single package which exceeds:

  (1) 3000 times the A_1 value of the radionuclides as specified in Section 173.433 for special form radioactive material;

  (2) 3,000 times the A_2 value of the radionuclides as specified in Section 173.433 for normal form radioactive material; or

  (3) 30,000 curies, whichever is least.

The following definitions are abstracted from Title 49, Code of Federal Regulations, Part 173:

- A_1 - The maximum activity of special form radioactive material permitted in a Type A package.

- A_2 - The maximum activity of radioactive material, other than special form or low specific activity radioactive material, permitted in a Type A package. These A_1 and A_2 values are either listed in Section 173.435 or may be derived in accordance with the procedure prescribed in Section 173.433.

- Special Form - Radioactive material that is prepackaged or encapsulated in a special form capsule that can only be opened by destroying the capsule. The criteria for a material meeting the definition of special form are found in Section 173.469, Special Tests. Tests include impact, percussion, bending, heating, leaching, and immersion. A complete certification and supporting safety analysis must be available and on file by each shipper in compliance with Section 173.476.

- Normal Form - Radioactive materials that are not in special form are called normal form. Normal form materials are described in terms of physical form (solid, gas, powder, liquid, etc.) and chemical form (organic salt, nitrite, chloride, sludge, etc.).

- Type A Package - A Type A package is defined as its packaging together with its limited radioactive contents. Type A package contents are limited to A_1 or A_2.

- Type A Packaging - A packaging designed to retain the integrity of containment and shielding required by this part under normal conditions or transported as demonstrated by the tests set forth in Sections 173.465 or 173.466, as appropriate. Tests include: water spray (for 1 hour to simulate rainfall of 2 inches per hour), free drop (free fall onto a flat hard surface with distance specified according to packaging weight), compression (5 times the weight of the package for at least 24 hours), and penetration (impact from dropping a 13 pound bar (1-1/4 inch in diameter) vertically from a height of 3.3 feet). Each shipper of a Type A package is required to maintain on file a complete documentation of tests and supporting safety analysis that the construction methods, packaging design, and materials of construction are in compliance with the specifications.

- Type B Package - A Type B package is defined as its packaging together with its radioactive contents.

- Type B Packaging - A packaging designed to retain the integrity of containment and shielding required by this part when subjected to normal conditions or transport and hypothetical accident test conditions set forth in Title 10, Code of Federal Regulations, Part 71. This package must meet all

Type A criteria and requirements plus provide adequate protection for serious accident conditions with limited loss of shielding and no loss of containment. The series of accident test requirements include: water immersion (under 15 meters for not less than 8 hours), free drop (from 30 feet onto a flat unyielding surface), puncture (a free drop of 40 inches onto a 6 inch diameter cylindrical steel bar), and thermal test (30 minutes at 1475°F). Only Type B packaging is used for highway route controlled quantity shipments.

1.5 Overview of Federal and State General Routing Requirements

Overall authority to regulate the highway movement of hazardous materials is vested in the Federal Government through the Hazardous Materials Transportation Act of 1975, as amended by the Hazardous Materials Transportation Uniform Safety Act of 1990. The Hazardous Materials Transportation Act, as amended, requires the Secretary of the United States Department of Transportation, Research and Special Programs Administration, to issue regulations applicable to interstate, intrastate and foreign commerce. The United States Department of Transportation is the administering agency for the Secretary, and as such promulgates hazardous materials regulations.

State and local governments may also regulate hazardous materials, but only to the extent that they make no regulations which conflict with or are inconsistent with a federal regulation.

Section 13 of the Hazardous Materials Transportation Uniform Safety Act amended the statutory preemption authority under Section 112 of the Hazardous Materials Transportation Act (49 United States Code app. 1811) to provide that any requirement of a state or political subdivision is preempted if:

(1) compliance with both the state or political subdivision requirement and the Hazardous Materials Transportation Act, as amended, or the regulations adopted thereunder is not possible; or

(2) the state or political subdivision requirement is an obstacle to the accomplishment and execution of the Hazardous Materials Transportation Act, as amended, or its regulations.

Since 1977, the United States Department of Transportation has issued over 32 inconsistency rulings (with the Hazardous Materials Transportation Act, as amended, these become preemption determinations) concerning regulations of

municipalities, county governments, states, and other government agencies such as bridge, tunnel and turnpike authorities.

Notwithstanding the preemption of a state or local requirement, the Hazardous Materials Transportation Act, as amended, provides that the United States Department of Transportation may waive preemption upon a showing by the jurisdiction that its requirements afford an equal or greater level of protection to the public than is afforded by the federal requirements and its requirements do not unreasonably burden commerce.

The Federal highway routing preemption "General Rule" in Section 105 of the Hazardous Materials Transportation Act (49 United States Code app. 1804) as amended by Section 4 of the Hazardous Materials Transportation Uniform Safety Act, states that no state may establish, maintain, or enforce:

(1) any highway route designation over which hazardous materials may or may not be transported by motor vehicle, or

(2) any limitation or requirement with respect to such routing, unless such designation, limitation, or requirement is made in accordance with the procedural requirements of the Federal Standards and complies with the substantive requirements of the Federal Standards.

Regarding California's requirements for hazardous materials transportation, concern for the proper disposal and transportation of hazardous waste led to enactment of Section 31303, California Vehicle Code in 1984. This Section established the general routing requirement of using the most direct route utilizing state or interstate highways wherever possible. This Section also included a mechanism for the California Highway Patrol to prohibit hazardous waste transportation on designated highways when a safer alternative could be established using specific guidelines set forth in Section 31304.

Effective January 1, 1987, Section 31303, California Vehicle Code was amended to require all vehicles required to be placarded or marked in accordance with Section 27903, California Vehicle Code (other than those subject to more specific requirements such as certain shipments of explosives, inhalation hazards and radioactive materials) to comply with the general routing requirements. Further, the route selection criteria was changed to require use of interstate or state highways offering the least overall transit time whenever practicable.

1.6 Overview of Federal and State Routing Requirements for Highway Route Controlled Quantity Shipments of Radioactive Materials

The United States Department of Transportation has established specific highway routing requirements for highway route controlled quantity shipments of radioactive materials. These requirements are codified in Title 49, Code of Federal Regulations, Section 177.825(b), which states:

> (b) ...a carrier or any person operating a motor vehicle containing a highway route controlled quantity of radioactive materials...shall operate the motor vehicle only over preferred routes...selected...to reduce time in transit...
>
> (1) A preferred route is either or both an Interstate System highway for which an alternative route is not designated by a State routing agency...or a State designated route selected by a State routing agency...in accordance with the following conditions:
>
> (i) The State routing agency shall select routes to minimize radiological risk using "Guidelines for selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Class 7 Radioactive Materials," or an equivalent routing analysis which adequately considers overall risk to the public....
>
> (ii) State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways....

Title 49, Code of Federal Regulations, Section 177.825(b), provides authority for a state routing agency to "designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways" for the transportation of highway route controlled quantity shipments of radioactive materials. In addition, designations of alternate preferred routes must be proceeded by substantive consultation with affected local jurisdictions and with any other affected states to ensure consideration of all impacts and continuity of designated routes.

Title 49, Code of Federal Regulations, Section 177.825(b)(2), provide conditions when motor vehicles may be operated over a route, other than a preferred route while transporting highway route controlled quantity shipments of radioactive materials. Deviation from the preferred route may occur for the following:

- necessary pickup and delivery
- necessary rest, fuel or motor vehicle repair stops
- emergency conditions make continued use of the preferred route unsafe or impossible.

The responsibility for highway routing of hazardous materials, including Class 7 radioactive materials and the related preemption determination and waiver of preemption procedures, has been delegated by the Secretary of Transportation to the Federal Highway Administration. The Federal Highway Administration incorporated, without substantive change, Research and Special Programs Administration's regulations in Title 49, Code of Federal Regulation, Sections 107.201 to 102.227, and 177.825 into the Federal Highway's regulations in Title 49, Code of Federal Regulation, Part 397, subpart D and E, respectively.

Full excerpts of these federal regulations are provided in Annex B.

Section 33000, California Vehicle Code requires the California Highway Patrol to adopt regulations designating routes for the transportation of highway route controlled quantity shipments of radioactive materials.

2. ROUTING STUDY METHODOLOGY

2.1 Risk Assessment Methodology

The route risk assessments were conducted with consideration of existing federal and State routing requirements and in compliance with the United States Department of Transportation, Research and Special Programs Administration, "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials" (DOT/RSPA/HMS/92-02, hereinafter referred to as the federal guidelines).

- Federal Routing Guidelines:

  Primary Risk Factors - Federal guidelines emphasize that the route selection should be based on the risk which is associated with the radiological nature of the cargo. This approach results in the selection of routes that minimize the total impact associated with normal exposure and the potential consequences of an accidental release of radioactive materials. Consequently, the following are considered by the federal guidelines to be the primary route comparison factors:

  - Normal radiation exposure - Shipping packages containing radioactive materials emit radiation during transport. Sufficient shielding must be contained in the package to reduce this radiation to safe levels as specified in Department of Transportation regulations. Exposure could vary significantly among available routes and should be considered during route selection.

  - Public health risks from accidents - Highway route controlled quantity shipments contain amounts of radioactive materials that are potentially harmful to the public if released. For this reason, these materials may only be transported in shipping packages (approved by the United States Department of Transportation, United States Department of Energy, or the Nuclear Regulatory Commission) designed to isolate the materials from the public, even in severe transportation accidents.

  - Economic risk from accidents - A very severe transportation accident could also result in contamination of nearby property. The frequency of severe transportation accidents which could cause contamination must also be considered during route selection.

Secondary Risk Factors - Factors that are considered secondary to the basic goal of minimizing the radiological risk from transportation are identified below. These secondary factors may be considered if the route analysis reveals that alternative routes have essentially the same level of risk based on the three primary factors.

- Emergency response capabilities - If a severe transportation accident results in radioactive material being released from the shipping package, actions by emergency response personnel can mitigate the potential consequences from the release. These factors could vary significantly among available routes.

- Evacuation - One method of mitigating the consequences of a radioactive material release is to evacuate those who could potentially be exposed to the material. The time and effort required to evacuate a segment of the population may vary among the available routes. Evacuation is often ordered as a precautionary measure if an accident occurs, even if a release has not been confirmed. Evacuation has economic impacts which may also be considered in comparing available routes.

- Location of special facilities - Some private and public facilities along transportation routes contain populations requiring special consideration when analyzing the potential effects of accidental releases of radioactive materials or exposure during transport. The number and type of such facilities (i.e. stadiums, schools and hospitals, etc.), provide a basis for comparing alternative routes.

- Traffic fatalities and injuries - Trucks carrying radioactive materials may be involved in traffic accidents, just like other vehicles. Routes that minimize these accidents would be preferred.

The "primary" route risk comparison factors form the basis for route selection. The remaining or "secondary" factors may be used if no clear-cut choices emerged from the evaluation of the primary factors.

- Additional Routing Considerations:

The California Highway Patrol contemplated additional routing considerations such as physical constraints of roadways, inadequate shoulders, turning radius for commercial vehicle traffic; and height, weight, and/or width restrictions. Legal constraints for consideration include factors

such as bridges, tunnels, toll crossings, or highway restricted to the through transportation of hazardous materials/waste by administrative action pursuant to Section 31304, California Vehicle Code. Annex D provides a list of routes restricted to the through transportation of hazardous materials and hazardous waste.

Time of day and day of week considerations are deferred to federal regulation currently found in Title 49 Section 177.825 (b)0(2), Code of Federal Regulations.

2.2 Survey: Highway Route Controlled Quantity Shipments of Radioactive Materials Transportation

- Purpose

To conduct the comparative risk analyses necessary to evaluate alternate routes, it was necessary to identify common points of origin and destination for highway route controlled quantity shipments of radioactive materials. No such database or flow study existed that identified these points in California.

The California Highway Patrol's Hazardous Materials Section has the responsibility for licensing all carriers transporting hazardous materials in the State. The license application; however, does not contain information on whether radioactive material is to be transported.

All facilities using radioactive materials, except those exclusively licensed by the Nuclear Regulatory Commission, are required to be licensed by the California Department of Health Services. The California Department of Health Services issues a Radioactive Materials License to those qualified facilities. The California Highway Patrol obtained a mailing list for 2,253 radioactive materials licensees[1] and mailed a survey questionnaire to each licensee. The survey requested the licensee to answer six questions relating to the transportation of highway route controlled quantity shipments of radioactive materials. The questions were as follows:

1. Identify by name, any highway route controlled quantity shipments of radioactive materials transported or received.

[1]Licensees as of March 1993

2. Provide an annual estimate of highway route controlled quantity shipments, by name, transported or received.

3. Identify the nearest major highway intersection to your facility.

4. If highway route controlled quantity shipments leave your facility, identify the nearest major highway intersection to the shipment destination. If the shipment leaves California, identify the highway used.

5. Provide the name(s) and address for each carrier that transports or delivers highway route controlled quantity shipments to/from your facility.

6. Identify the time of day and day of week your facility sends and or receives highway route controlled quantity shipments.

The Hazardous Material Section received approximately 300 telephone calls and 130 completed questionnaires. Of the total responses received, seven licensees indicated they transported or received highway route controlled quantity shipments of radioactive materials.

- Shipment Origins and Destinations

The survey responses identified seven origin and destination points. Additional origin and destination points were identified through contacts with the California Department of Health Services, the Nuclear Regulatory Commission, the United States Department of Energy and the Federal Highway Administration.

- Interested Party Mailing List

Fifty-three licensees completing the "Highway Route Controlled Quantity Shipments of Radioactive Materials Survey" requested to be included on an interested party mailing list. The mailing list was further expanded to include: consultative meeting invitees; administering agencies; local emergency responders along the proposed routes; California Department of Transportation Districts; State Regional Offices of Emergency Services; and other interested government agencies and private parties requesting information.

2.3 HazTrans®

To complete the required route risk assessments on approximately 2,434 miles of California highways (Interstate routes), the California Highway Patrol used HazTrans®, a computer based route risk assessment program developed by Abkowitz and Associates, Inc., in association with Vanderbilt University. The California Highway Patrol entered into a contract with Vanderbilt University in 1989 to provide a California specific version of this software. The routing methodology incorporated into the HazTrans® program exceeds the criteria established in the federal guidelines.

The HazTrans® contract includes the maintenance of this California unique database. HazTrans® allows for conducting route risk assessments with consideration of the following routing criteria: population exposure, distance, travel time, accident likelihood, risk and radiological risk.

HazTrans® provides the State of California with a flexible and easy-to-use, yet comprehensive tool for evaluating risks and selecting preferred routes associated with the shipment of highway route controlled quantity shipments of radioactive material. HazTrans® consists of two major components, a mapping system and an analysis methodology, which are fully integrated.

The HazTrans® mapping system uses geographic information systems referencing that enables the display of color road maps of the entire roadway or subsystems. The highway system from which maps can be generated is a geographically-based network of the major highways in the United States, made available through Oak Ridge National Laboratory. It is based on United States Geological Survey, 1:2,000,000 scale maps, and includes all Interstates, and most State and United States Highways as well as some major county roads and other principal arterial roadways. The transportation network, in addition to providing location information, contains considerable attribute details about road characteristics. This served as a useful foundation for developing a more comprehensive transport network and routing methodology for the State of California.

The routing analysis component consists of the following features:

- highway system selection
- criterion selection
- origin and destination specification
- node/link inclusion or exclusion
- highlight identification

Once a routing analysis has been conducted, additional features are included in the mapping system so the results of the analysis can be observed on the computer screen. These include color-coded drawings of the most effective route based on the routing criteria selected, relevant statistical data for the selected route, and actual route directions indicating the preferred route.

Criterion selection allows for routing criteria to be identified. Five criteria are available for selection:

- distance
- travel time
- accident likelihood
- population exposure
- "risk" as defined by federal guidelines
- radiological risk (both normal transport exposure risk and public health risk).

Origin and destination selection specify the movement (shipment) under consideration. These shipping and receiving locations can be identified by either designating an appropriate point (nearest node) in the transportation network, or by selecting an appropriate zip code.

Node/link inclusion or exclusion is used while conducting an analysis, to require a shipment to pass through or avoid specific locations. This process identifies the most effective route if the shipment must pass through a specific location, either to drop off or pick-up a partial load or because routing regulations require the use of a certain transport segment. It also provides for avoidance of locations where routing designations apply or it is determined that the location is unsafe due to excessive accident likelihood, population exposure or for some other reason. In cases where a risk assessment on a specific route is desired, the route restriction function can be used to designate this route for exclusive consideration.

Highlight selection allows for specifying conditions of road segments which, if not met, can result in either identification of these sites on the map and/or the exclusion of these segments from analysis consideration. For example, what might appear to be the preferred route for a shipment in terms of the entire movement from origin to destination, could pass through individual network segments where accident likelihood or population exposure exceeds a level which may be considered safe. Subsequently, it can be determined whether to impose special conditions on these high hazard locations, such as removing the segment entirely from subsequent routing consideration.

- HazTrans® Databases/Sources

The databases contained in the California version of HazTrans® were derived from the most current sources available. The following provides a description of the California specific data that was used in completing the required route risk assessments:

Road Network - In addition to using the HazTrans® national road network for California, other segments have been included in the California system so that all Interstates, United States Routes, State Routes, and selected major county roads in the State of California are contained in the network, as well as points-of-entry from major routes of those states located adjacent to California.

Accident Rates and Accident Likelihood - Accident rates were derived from the California Department of Transportation, 1989 Route Segment Report, Volume 2. In that document, vehicle accident rates for each California highway segment are reported as a three-year historical average. This method gives a more realistic rate of accidents over a reasonable period of time.. These accident rates combine the likelihood of an accident with the likelihood of a release of the hazardous cargo given that an accident has occurred. Obviously, not all accidents will result in a release so that the release-causing accident rate will be somewhat lower than the vehicular accident rate. If truck accident rates were unavailable, then accident rates were derived from those developed by the Federal Highway Administration for the different functional classifications that appear in the United States roadway network.

Accident likelihood is computed per shipment and uses a qualified approach. The likelihood that a particular shipment will not be involved in an accident along the entire route is based on the likelihood of safely traveling each prior segment along the route. The likelihood, then, of no accident occurrence along the route, defined as "$Reliability_{route}$", is computed by:

$$Reliability_{Route} = \prod_{i=1}^{n} (1 - DIST_i * ACC\ RATE_i)$$

where $DIST$ = distance on segment i
$ACC\ RATE$ = accident rate on segment i
n = total number of segments in entire route

The shipment accident likelihood is simply one minus the shipment reliability.

Travel Time - Travel times, also derived from the California Department of Transportation, 1989 Route Segment Report, Volume 2, are based on observed (rather than posted) operating speeds, and are converted to travel time based on the segment length. For county roads in California which were added to the system, if California Department of Transportation information was not available, HazTrans® national travel time and accident rate assumptions were used based on formulas adopted by the Federal Highway Administration and the American Association of State Highway Transportation Officials.

Segment Population - Exposure values were determined by overlaying the "block level" population statistics from the 1990 United States Census onto the transportation networks and determining the population residing within each of the pre-defined bandwidths. The "block level" data is the most detailed population data available in a geographically referenced format.

Risk - The criteria for determining relative risk is defined by the federal routing criteria guidelines as follows:

$$RISK_{route} = \sum_{l=1}^{L} [P(Accident)_l \cdot P(Release) \cdot Consequence_l^{Risk\ Preference}]$$

where L is the number of segments (or links) in the route, $P(Accident)_l$ is the accident likelihood along segment l, $P(Release)$ is the likelihood that an accident will result in a release, $Consequence_l$ is the expected consequences of a release along segment l. Beyond representing the Federal definition of risk, HazTrans® risk models can also distinguish between technical and perceived risk. *Risk Preference* is used to represent the differences between public perception and technical judgement.

Radiological Risks - The risks associated with normal transport exposure and the public health risk involved with radioactive material shipments are used to calculate a relative radiological risk index.

- Normal Transport Exposure - Federal routing guidelines suggests that radiological risk associated with the normal transport of radioactive materials be computed by:

D	=	Dose to persons residing along the route	+	Dose to passengers in other vehicles	+	Dose to Truck crew	+	Dose to people at truck stops

Upon review of the California Highway Patrol "Risk Assessments for Transportation of Radioactive Materials on California's Highways (1989)" the "dose to passengers in other vehicles" component of the risk equation was found to zero out. HazTrans® computes the normal transport exposure risk as follows:

D	=	Dose to persons residing along the route	+	Dose to Truck crew	+	Dose to people at truck stops

In this calculation, HazTrans® used the length of the route, average speed of the vehicle along the route, and the average population density (in people per square mile within a five mile bandwidth) along the route.

- Public Health Risk - The frequency of release-causing accidents and the consequences of such a release are the criteria used to calculate the relative public health risk.

Public Health Risk	=	Frequency of Accident	x	Consequence measure

Consequence as defined by the federal routing guidelines is a measure of the exposed population computed by:

For rural segments:

Consequence measure	=	Population per square mile for a 0 to 5 mile bandwidth	x .75	+	Population per square mile for for a 5 to 10 mile bandwidth	x .25

For urban segments:

Consequence measure	=	Population per square mile for a 0 to 5 mile bandwidth	x 1.00

Normalized values of the normal transport exposure and public health risk are equally weighted to determine the radiological risk as follows:

Radiological Risk	=	Normal transport exposure risk bandwidth	x .5	+	Public health risk	x . 5

Emergency response - This information is currently identified in the HazTrans® system in terms of response times from California Highway Patrol field offices to destinations along the proposed routes within the office's jurisdiction.

- HazTrans® Methodology for Criteria Weighing

In addition to specifying a single criterion for a route, HazTrans® can use any combination of the five criteria to obtain alternatives between the two extremes of cost versus safety. This is implemented by assigning percentage weights to each of the criteria to be used in a route determination that corresponds to the emphasis placed on that criterion. These weights must always sum to 100 percent.

Routing analyses were conducted with consideration of both overall radiological risk factors and travel time. Routes with physical or legal constraints were eliminated from consideration. Special attention was given to the correlation between population exposure and realistic travel times for commerce. Route optimization, using the HazTrans® risk assessment software, is performed using a double-sweep method. This method is one of a family of "shortest path" algorithms which are typically used for network optimization. This method finds the global optimum for each criteria applied to the network. In many instances, the same route was identified even when alternate route selection criteria have been used.

Each route analysis was conducted independently, examining each route alternate for the route offering an acceptable balance between radiological risk and transit time. When the route HazTrans® selected to maximize radiological risk was different from the route selected to maximize travel time, the route maximizing overall radiological risk reduction was selected.

- Documentation

  Documentation of the route risk assessments, including maps, route directions and statistics, for preferred routes identified using HazTrans® are contained in Section 3, Through Routes for the Transportation of Highway Controlled Quantity Shipments of Radioactive Materials Documentation, of this report.

- Validation and Verification

  Review, verification and validation of the route risk assessment methodology and analyses was conducted by staff and faculty of Vanderbilt University.

- Economic Consequence

  Upon review of the California Highway Patrol's "Risk Assessments for Transportation of Radioactive Materials on California's Highways," (a report from 1989) an economic consequence component was not added to HazTrans® radioactive materials risk assessment abilities. This report stated that, "Because of the need to define our data elements, the myriad of public agencies involved in the compilation of these data, the use of census tracts, and the divergent data sources, land use data results are easily the least defensible element of our RAM routing study."

  As an experiment, the analysis team recalculated the risk assessment for the current preferred route, and the eight alternative routes between Lost Hills and Barstow, without regard to economic consequence. They noted that the ranking of the nine routes does not differ when comparing the results of the risk assessment with or without the economic component. They attributed this to "the assumed high correlation between population (which is used in the normal transportation exposure and public health risk calculations) and land use data (which is the only factor considered in the economic consequence calculation)."

  In this study, the level of effort required to collect the land use data needed to determine the economic component was found to comprise 75 percent of the total analysis time. In order for HazTrans® to assess the economic component, land use data information for the entire state would be required. In our opinion, the effort required to acquire and maintain this land use data information at the required level of detail is not justified by the resulting benefit.

2.4 Consultative Meeting: Highway Route Controlled Quantity Shipments of Radioactive Materials

To assist with the implementation process requirements and provide a forum for the consultation suggested by the federal guidelines, a consultative meeting was held in August 1993. Representatives from the following organizations were invited to attend: radioactive material manufacturers and transporters, California health physicists, engineers and scientists, local government organizations, an environmental group, the California Department of Health Services, California Department of Transportation, Office of Emergency Services, Office of the State Fire Marshall, Federal Highway Administration, United States Department of Energy, Nuclear Regulatory Commission, Abkowitz and Associates, Inc., representatives from adjoining states, and additional interested parties. An invitee list and an attendance roster is provided in Annex C.

The purpose of the consultative meeting was two-fold:

(1) To encourage open communication and support for the development of routes by involving government and industry in the implementation process, and

(2) To consult with government and industry representatives to gain information necessary for the formulation of regulations and the designation of routes.

Consultative meeting participants played a critical role in the development and review of the proposed routing regulations.

2.5 Environmental Impact Analysis

Environmental concerns are addressed as part of the Department's routing study.

The California Highway Patrol is proposing to adopt regulations to designate routes for the through transportation of highway route controlled quantity shipments of radioactive materials. The federal government has established all interstate highways as approved routes. The Department of California Highway Patrol is proposing to designate only those routes necessary for through transportation. The proposed regulations involve no expansion of the current preferred routing system for the shipment of radioactive materials.

In fact, the proposed routes for the through transportation of highway route controlled quantity shipments of radioactive materials will not create additional environmental hazards, but will mitigate and reduce risks already in existence. The Hazardous Materials Transportation Act, as amended, provides the federal government authority to designate routes for both inter- and intra-state transportation of hazardous materials. In the absence of specific state designated routes, transporters are required by federal regulations to use interstate highways. The adoption of these routes will cause no overall increase in highway route controlled quantity shipments of radioactive materials traffic; it will actually reduce highway route controlled quantity shipments of radioactive materials on routes which are not as safe as those proposed in this study.

The California Environmental Quality Act requires consideration of physical effects on the environment for actions such as the adoption of these proposed regulations. The California Highway Patrol has conducted an environmental review according to the California Environmental Quality Act and has determined that the proposed regulations meet the requirements for a categorical exemption under Class 1, Section 15301; and Class 8, Section 15308. In light of the above, the Department proposes to adopt such exemptions at the completion of the regulatory process. The Department's primary environmental consideration has been consistent with the intent of the federal guidelines, preservation of human life. Additionally, environmental factors were given appropriate consideration during the study.

2.6 Route Evaluations

- Consultations with Oregon, Nevada and Arizona

  Each neighboring state was asked for their review and official comment on the proposed routes. In addition, adjoining states were requested to forward information regarding their current or proposed routing regulations for highway route controlled quantity shipments of radioactive materials to the Hazardous Materials Section.

- Designated Routes in Adjoining States

  Arizona has adopted the interstate highway system set forth in federal regulations specified in Title 49, Code of Federal Regulations, Section 177.823.

Nevada has not adopted their own preferred route system, therefore by default the interstate highway system is the preferred route system.

Oregon has adopted the interstate highway system set forth in federal regulations specified in Title 49, Code of Federal Regulations, Section 177.823.

To ensure continuity of routes between adjoining states, coordination with other state routing authorities is crucial and essential. Accordingly, California's entry and exit points are located on the Interstate Highways since all adjoining states presently use only the Interstate Highway System.

3. THROUGH ROUTE ANALYSIS DOCUMENTATION

3.1 Summary

Risk assessments were conducted for each transportation route used to assess each shipment origin and destination point, for the purpose of establishing a "through" route. The routing analyses did not attempt to conduct "door-to-door" routing, as local routing was not the intent nor within the scope of authority of the California Highway Patrol. Accordingly, the proposed routes (maps) and routing statistics generated by HazTrans®, and presented in the following documentation, are calculated to the nearest major highway junction rather than to a specific facility, off-ramp, or local intersection.

Routes were not established without an identified need. As a result, the number of initial routes has been kept to a minimum and are in accordance with federal guidelines. It is anticipated that an annual review of the designated routes will be required to reevaluate existing routes and assess the need for additional routes.

For purposes of determining risk and the affected population exposure, a five mile band along each roadway was used. The five mile band is recommended by the Federal government and is based on worst case protective action distances for a shipment of plutonium contaminated waste igniting and vaporizing. Population at risk identified in the Through Routes for the Transportation of Highway Controlled Quantity Shipments of Radioactive Materials documentation in this Section was determined based on the criteria discussed in Section 2.3 of this document.

3.2 Through Route Analyses

In order to evaluate a preferred route highway network for the transportation of highway route controlled quantity shipments of radioactive materials in California, it was necessary to locate facilities which have been known to possess highway route controlled quantities of radioactive materials.

The highway route controlled quantity of radioactive materials survey identified seven facilities which possess or have the authority to possess highway route controlled quantities of radioactive materials. These facilities are located in the following areas: Avila Beach, Eureka, Irvine, Menlo Park, San Diego, Santa Clara and Tustin.

In order to locate additional facilities which may not have responded the survey mentioned above, the California Highway Patrol contacted the California Department of Health Services, Nuclear Regulatory Commission, United States Department of Energy and Federal Highway Administration. These inquiries yielded nine additional facilities located in the following areas: Anaheim, Herald, Irvine, Livermore, Oakland, Pleasanton, San Fernando, San Francisco and San Onofre.

Route analyses were conducted for through routes from the facilities identified above. To avoid redundancy, single through routes were identified for those facilities located within close proximity to one another.

Each of the facility areas was used as a starting point and analyzed by HazTrans® using six points of departure from California. The six points of departure are Interstate Highways 5, 80, 15, 40, 10 and 8. These Interstate highways border the adjoining states of Oregon, Nevada and Arizona.

A total of 90 individual routes were analyzed and are numbered from 1-1 through 15-6 in the following pages. The first number in the route designation is the starting point, which run from 1 to 15 and traverse the State from north to south. The second number is the point of departure, which run from 1 through 6 and also traverse the State from north to south. The list of numbers and the corresponding facility area locations and points of departure are as follows:

Facility Areas

1 = Eureka
2 = Herald
3 = Oakland
4 = San Francisco
5 = Livermore
6 = Pleasanton
7 = Menlo Park
8 = Santa Clara
9 = Avila Beach
10 = San Fernando
11 = Anaheim
12 = Tustin
13 = Irvine
14 = San Onofre
15 = San Diego

Points of Departure

1 = Interstate 5 CA/Oregon Border
2 = Interstate 80 CA/Nevada Border
3 = Interstate 15 CA/Nevada Border
4 = Interstate 40 CA/Arizona Border
5 = Interstate 10 CA/Arizona Border
6 = Interstate 8 CA/Arizona Border

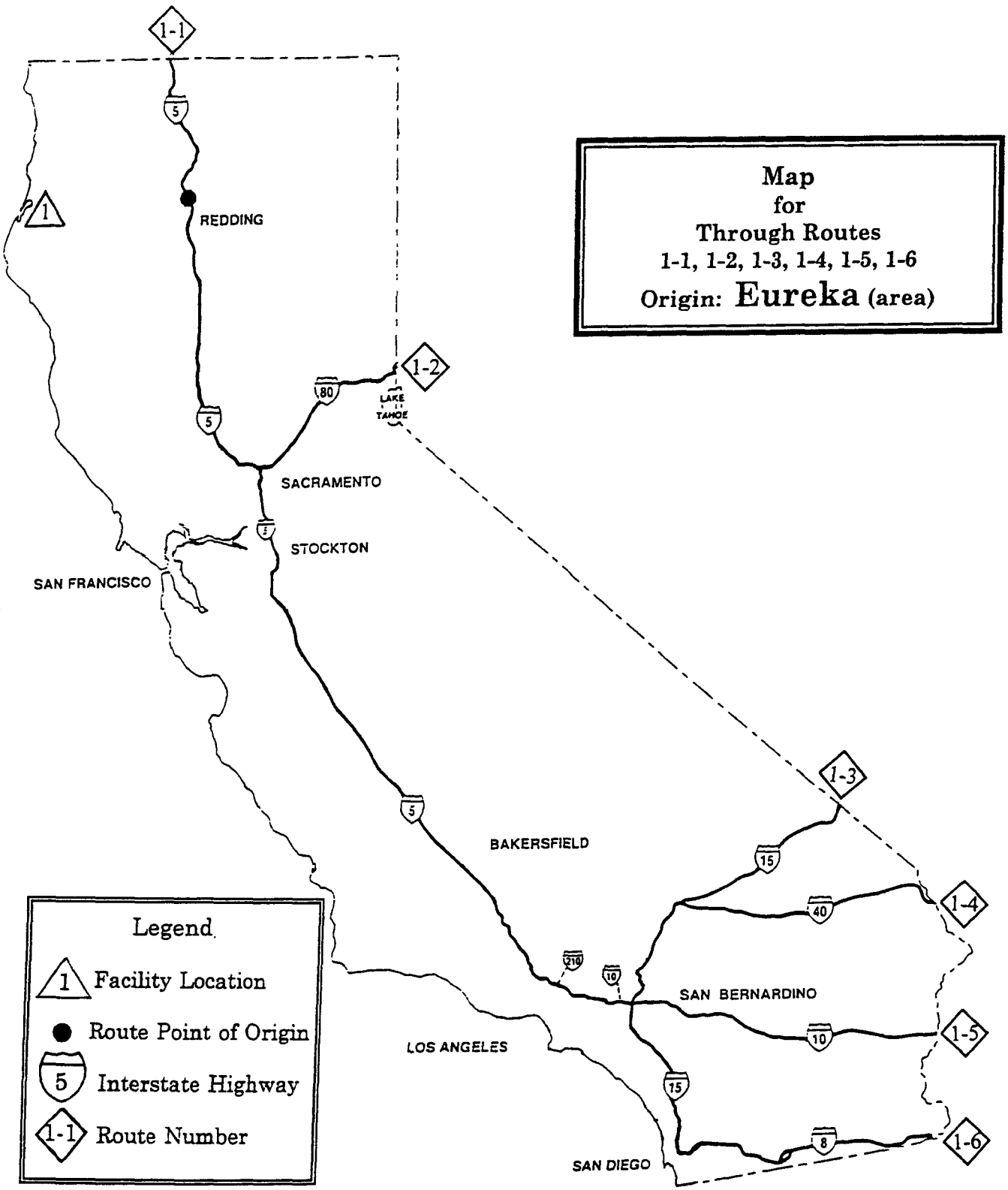
To clarify the numbering system used, the following example is provided: route designation 6-4 is a route originating in the Pleasanton area and departing California on Interstate 40 at the Arizona border. The points of origin and destination are interchangeable in this study. Using example 6-4, identified above, the shipment could originate somewhere outside the California border and enter on Interstate 40 with a destination of Pleasanton.

The Compilation of these 90 routes is what forms the preferred highway route network for the through transportation of highway route controlled quantity shipments of radioactive materials in California.

3.3 Point of Origin Maps and Statistical Data

The following route maps and accompanying statistical data are provided to identify route origins and destinations, Interstate Highways utilized, route heading, route segment miles and total route length. Also included is the estimated travel time for each route, total population along each route and the probability of a successful trip based on accident data. In addition, a risk index is included. The risk index normalizes the values of all 90 routes based on normal radiation exposure plus health risk from a potential release of the material being transported.

3.3.1 Eureka


Map
for
Through Routes
1-1, 1-2, 1-3, 1-4, 1-5, 1-6
Origin: Eureka (area)
1-1
1-2
1-3
1-4
1-5
1-6
REDDING
SACRAMENTO
LAKE TAHOE
STOCKTON
SAN FRANCISCO
BAKERSFIELD
SAN BERNARDINO
LOS ANGELES
SAN DIEGO
Legend
1 Facility Location
Route Point of Origin
5 Interstate Highway
1-1 Route Number

THROUGH ROUTE ANALYSIS FOR ROUTES 1-1, 1-2, 1-3, 1-4, 1-5, 1-6

Origin: 1. Eureka (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
1-1	5	North	97.45	97.45	1hr 43min	28,474	29.22	.999968	0.20
1-2	5 80	South East	181.06 118.21	299.27	5hr 38min	965,701	322.69	.999927	0.89
1-3	5 210 10 15	South East East North	542.34 48.78 13.99 186.23	791.34	14hr 44min	4,175,330	527.63	.999912	2.43
1-4	5 210 10 15 40	South East East North East	542.34 48.78 13.99 74.45 154.68	834.24	15hr 18min	417,666	500.66	.999912	2.55
1-5	5 210 10	South East East	542.34 48.78 199.62	790.74	14hr 45min	4,678,339	591.64	.999912	2.49

THROUGH ROUTE ANALYSIS FOR ROUTES 1-1, 1-2, 1-3, 1-4, 1-5, 1-6

Origin: 1. Eureka (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

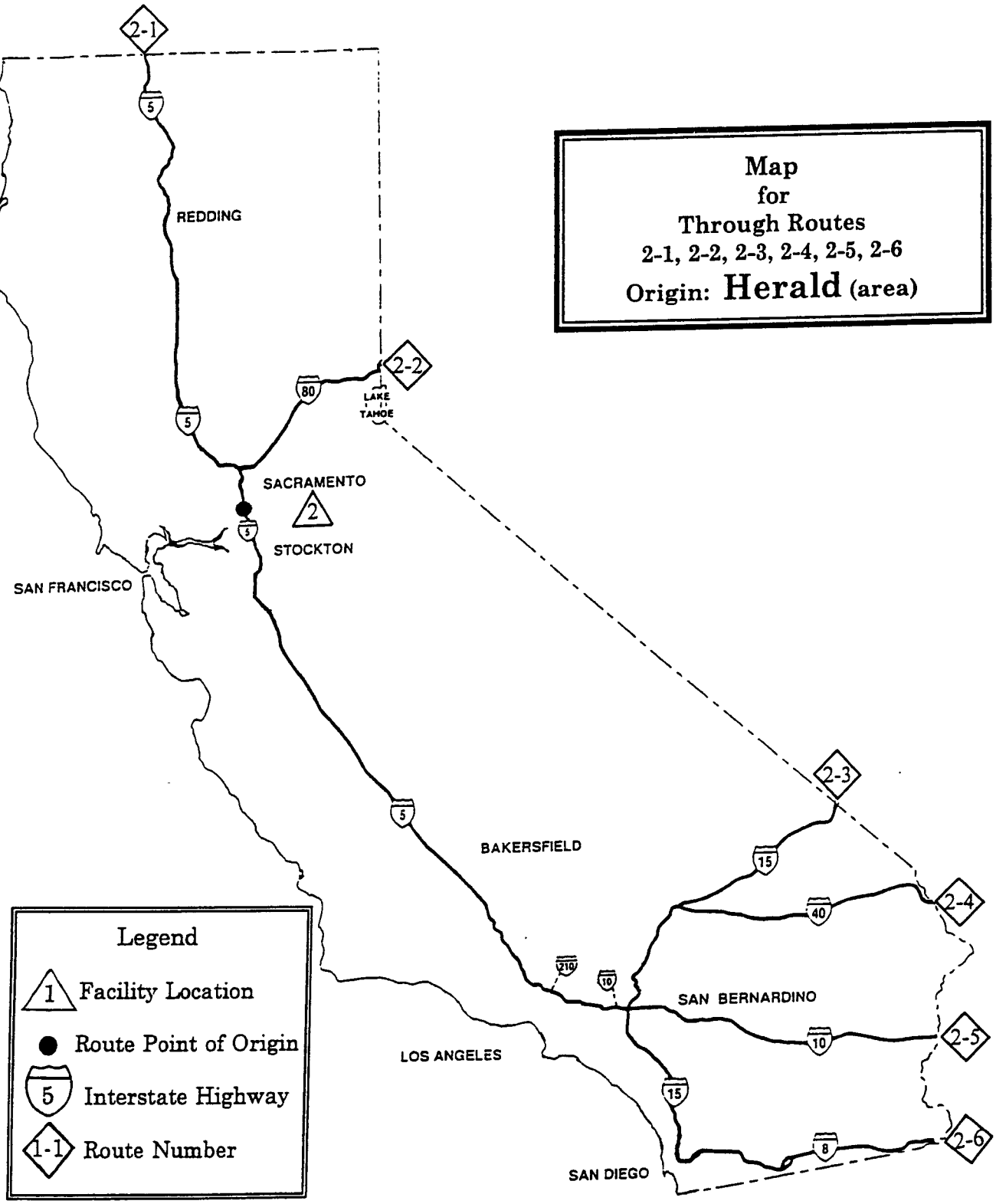
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
1-6	5	South	542.34	874.95	16hr 20min	5,572,760	636.92	.999911	2.90
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.2 Herald


Map
for
Through Routes
2-1, 2-2, 2-3, 2-4, 2-5, 2-6
Origin: Herald (area)
2-1
5
REDDING
2-2
80
LAKE TAHOE
5
SACRAMENTO
2
5
STOCKTON
SAN FRANCISCO
5
BAKERSFIELD
2-3
15
2-4
40
210
10
SAN BERNARDINO
10
2-5
LOS ANGELES
15
8
2-6
SAN DIEGO
Legend
1 Facility Location
Route Point of Origin
5 Interstate Highway
1-1 Route Number

THROUGH ROUTE ANALYSIS FOR ROUTES 2-1, 2-2, 2-3, 2-4, 2-5, 2-6

Origin: 2. Herald (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
2-1	5	North	306.37	306.37	5hr 30min	801,714	261.68	.999935	0.80
2-2	5 80	North East	27.86 118.21	146.07	3hr 1min	1,198,987	820.83	.999942	0.63
2-3	5 210 10 15	South East East North	333.42 48.78 13.99 186.23	582.42	10hr 57min	3,402,090	584.13	.999916	1.82
2-4	5 210 10 15 40	South East East North East	333.42 48.78 13.99 74.45 154.68	625.32	11hr 31min	3,403,426	544.27	.999914	1.94
2-5	5 210 10	South East East	333.42 48.78 199.62	581.82	10hr 59min	3,905,099	671.19	.999915	1.99

THROUGH ROUTE ANALYSIS FOR ROUTES 2-1, 2-2, 2-3, 2-4, 2-5, 2-6

Origin: 2. Herald (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

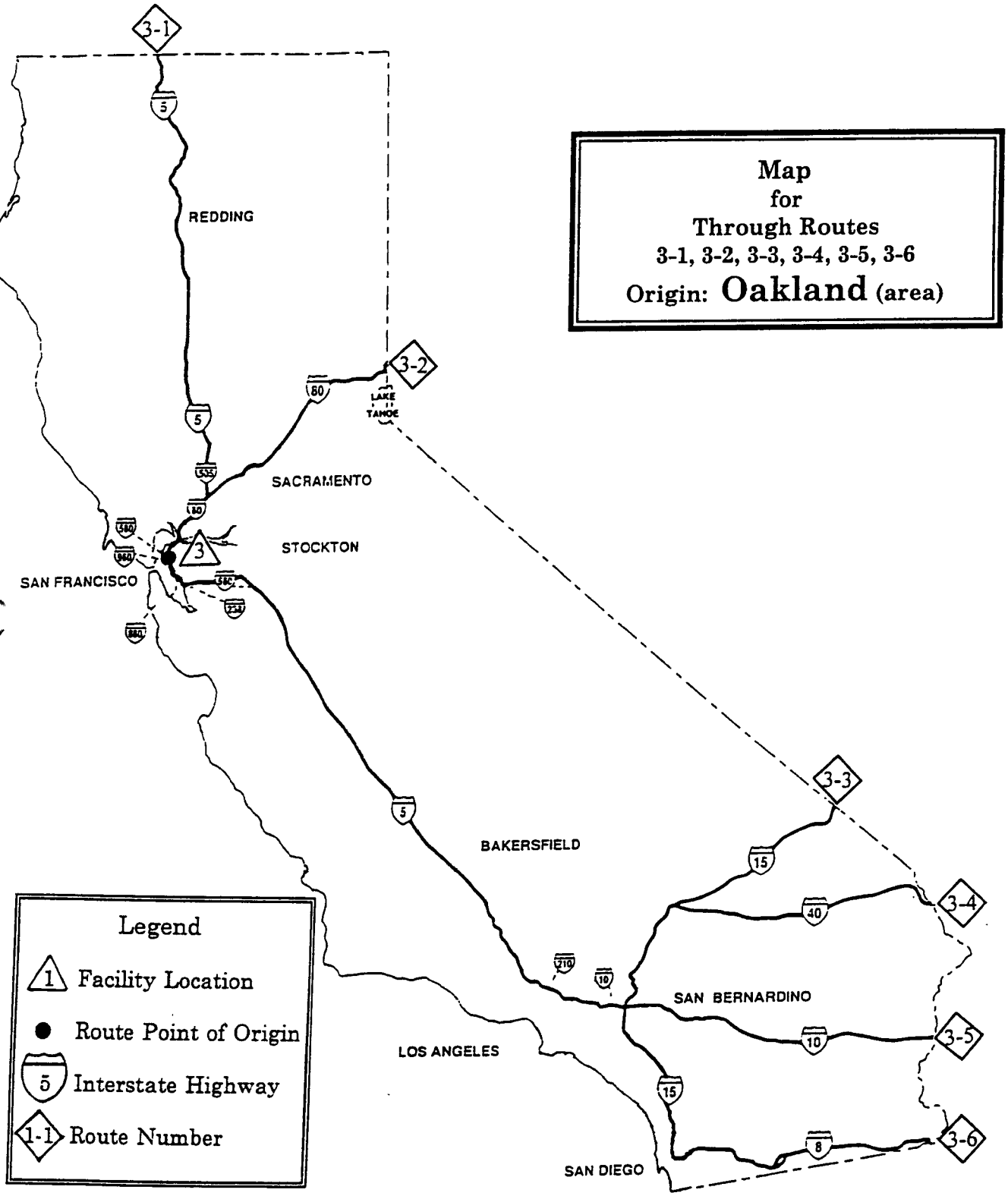
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
2-6	5	South	333.42	666.03	12hr 33min	4,799,520	720.62	.999913	2.29
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.3 Oakland


Map
for
Through Routes
3-1, 3-2, 3-3, 3-4, 3-5, 3-6
Origin: Oakland (area)
Legend
1 Facility Location
Route Point of Origin
5 Interstate Highway
1-1 Route Number
3-1
3-2
3-3
3-4
3-5
3-6
REDDING
SACRAMENTO
STOCKTON
SAN FRANCISCO
LAKE TAHOE
BAKERSFIELD
SAN BERNARDINO
LOS ANGELES
SAN DIEGO

THROUGH ROUTE ANALYSIS FOR ROUTES 3-1, 3-2, 3-3, 3-4, 3-5, 3-6

Origin: 3. Oakland (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
3-1	980 580 80 505 5	North West East North North	2.02 1.32 50.12 32.97 249.16	335.59	6hr 21min	1,268,770	378.07	.999927	1.92
3-2	980 580 80	North West East	2.02 1.32 198.94	202.28	4hr 33min	1,891,217	934.95	.999929	1.89
3-3	880 238 580 5 210 10 15	South East East South East East North	10.98 1.99 46.12 284.33 48.78 13.99 186.23	592.42	11hr 29min	3,976,585	671.24	.999915	2.53

THROUGH ROUTE ANALYSIS FOR ROUTES 3-1, 3-2, 3-3, 3-4, 3-5, 3-6

Origin: 3. Oakland (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
3-4	880	South	10.98	635.32	12hr 3min	3,977,921	626.13	.999913	2.65
	238	East	1.99						
	580	East	46.12						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	74.45						
	40	East	154.68						
3-5	880	South	10.98	591.82	11hr 30min	4,479,594	756.92	.999915	2.59
	238	East	1.99						
	580	East	46.12						
	5	South	284.33						
	210	East	48.78						
	10	East	199.62						

THROUGH ROUTE ANALYSIS FOR ROUTES 3-1, 3-2, 3-3, 3-4, 3-5, 3-6

Origin: 3. Oakland (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

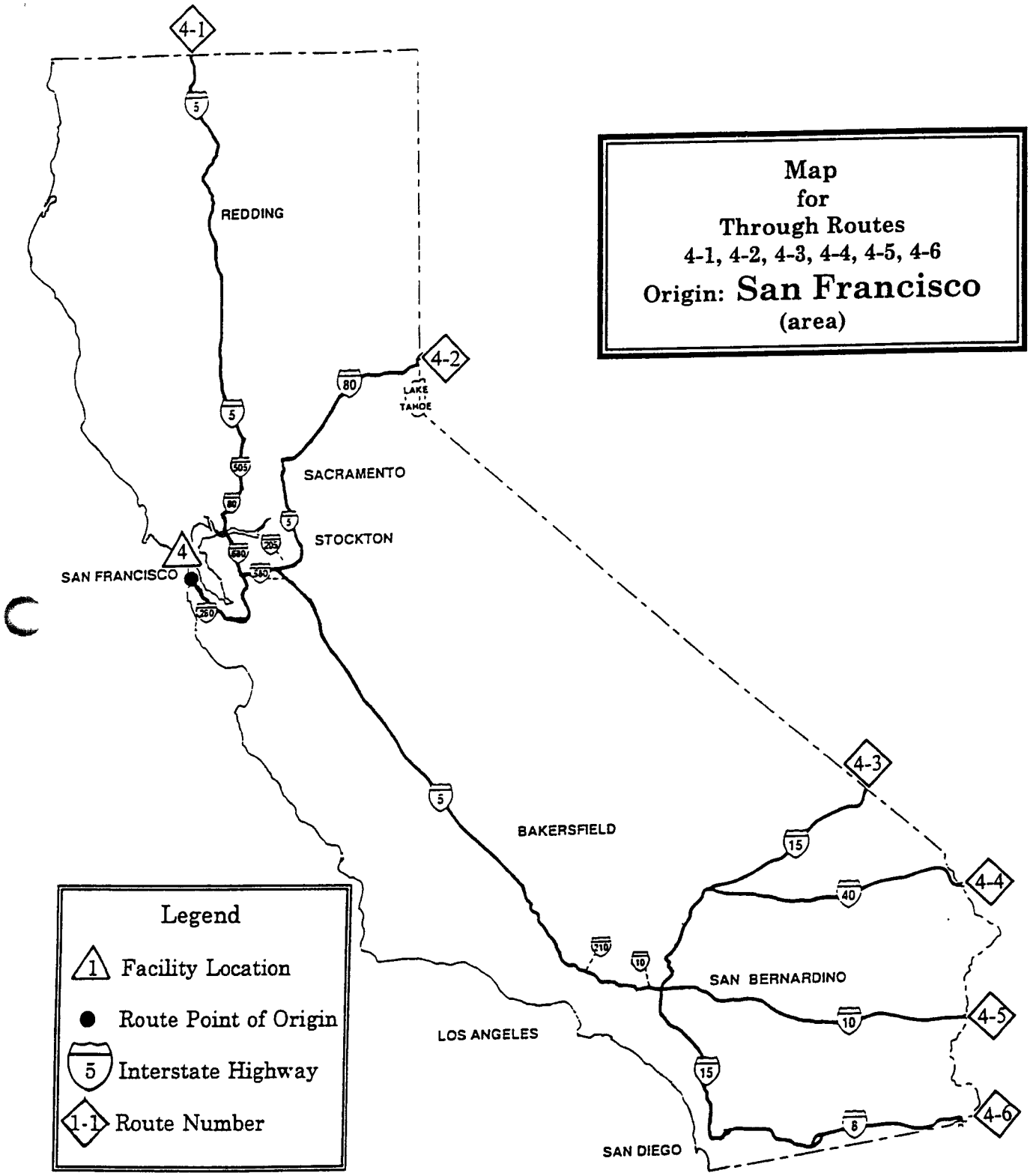
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
3-6	880	South	10.98	676.03	13hr 5 min	5,374,015	794.94	.999913	3.00
	238	East	1.99						
	580	East	46:12						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.4 San Francisco



THROUGH ROUTE ANALYSIS FOR ROUTES 4-1, 4-2, 4-3, 4-4, 4-5, 4-6

Origin: 4. San Francisco (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
4-1	280 680 80 505 5	South North East North North	42.64 70.34 15.93 32.97 249.16	411.04	8hr 10min	3,145,540	765.26	.999922	6.23
4-2	280 680 580 205 5 80	South North East East North East	42.64 30.04 20.29 12.93 64.54 118.21	288.65	6hr 15min	3,955,858	1370.47	.999924	6.17
4-3	280 680 580 5 210 10 15	South North East South East East North	42.64 30.04 35.93 284.33 48.78 13.99 186.23	641.94	12hr 35min	5,514,592	859.05	.999914	7.17

THROUGH ROUTE ANALYSIS FOR ROUTES 4-1, 4-2, 4-3, 4-4, 4-5, 4-6

Origin: 4. San Francisco (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
4-4	280	South	42.64	684.84	13hr 9min	5,515,928	805.43	.999912	7.29
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	74.45						
	40	East	154.68						
4-5	280	South	42.64	641.34	12hr 36min	6,017,601	938.29	.999914	7.29
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	199.62						

THROUGH ROUTE ANALYSIS FOR ROUTES 4-1, 4-2, 4-3, 4-4, 4-5, 4-6

Origin: 4. San Francisco (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

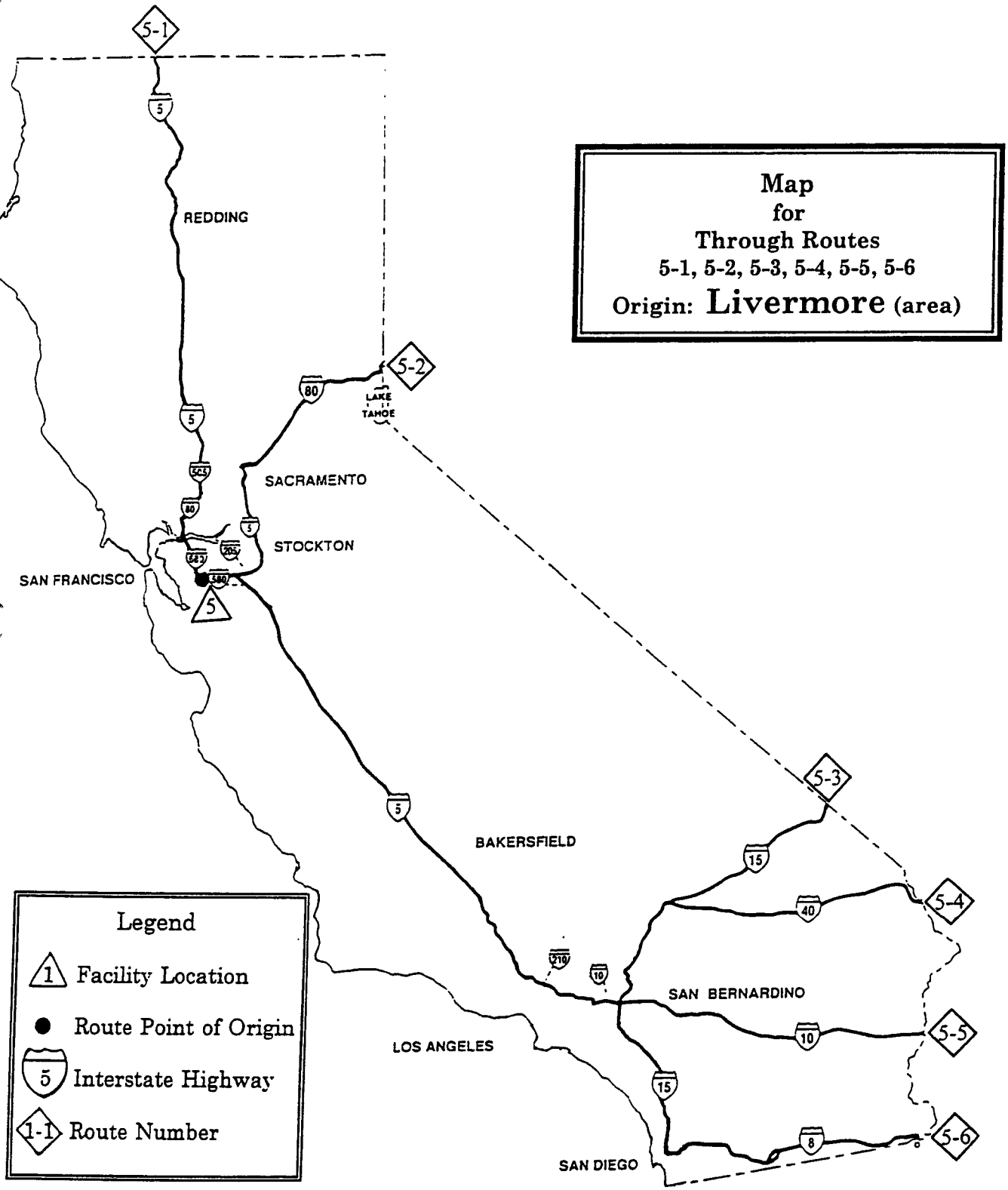
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
4-6	280	South	42.64	725.55	14hr 11min	6,912,022	952.66	.999912	7.55
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.5 Livermore



THROUGH ROUTE ANALYSIS FOR ROUTES 5-1, 5-2, 5-3, 5-4, 5-5, 5-6

Origin: 5. Livermore (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
5-1	580 680 80 505 5	West North East North North	10.03 40.30 15.93 32.97 249.16	348.39	6hr 42min	981,856	281.83	.999928	1.01
5-2	580 205 5 80	East East North East	10.26 12.93 64.54 118.21	205.94	4hr 15min	1,558,916	756.98	.999934	0.83
5-3	580 5 210 10 15	East South East East North	25.90 284.33 48.78 13.99 186.23	559.23	10hr 35min	3,117,650	557.49	.999916	1.79
5-4	580 5 210 10 15 40	East South East East North East	25.90 284.33 48.78 13.99 74.45 154.68	602.13	11hr 9min	3,118,986	517.99	.999914	1.91

THROUGH ROUTE ANALYSIS FOR ROUTES 5-1, 5-2, 5-3, 5-4, 5-5, 5-6

Origin: 5. Livermore (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

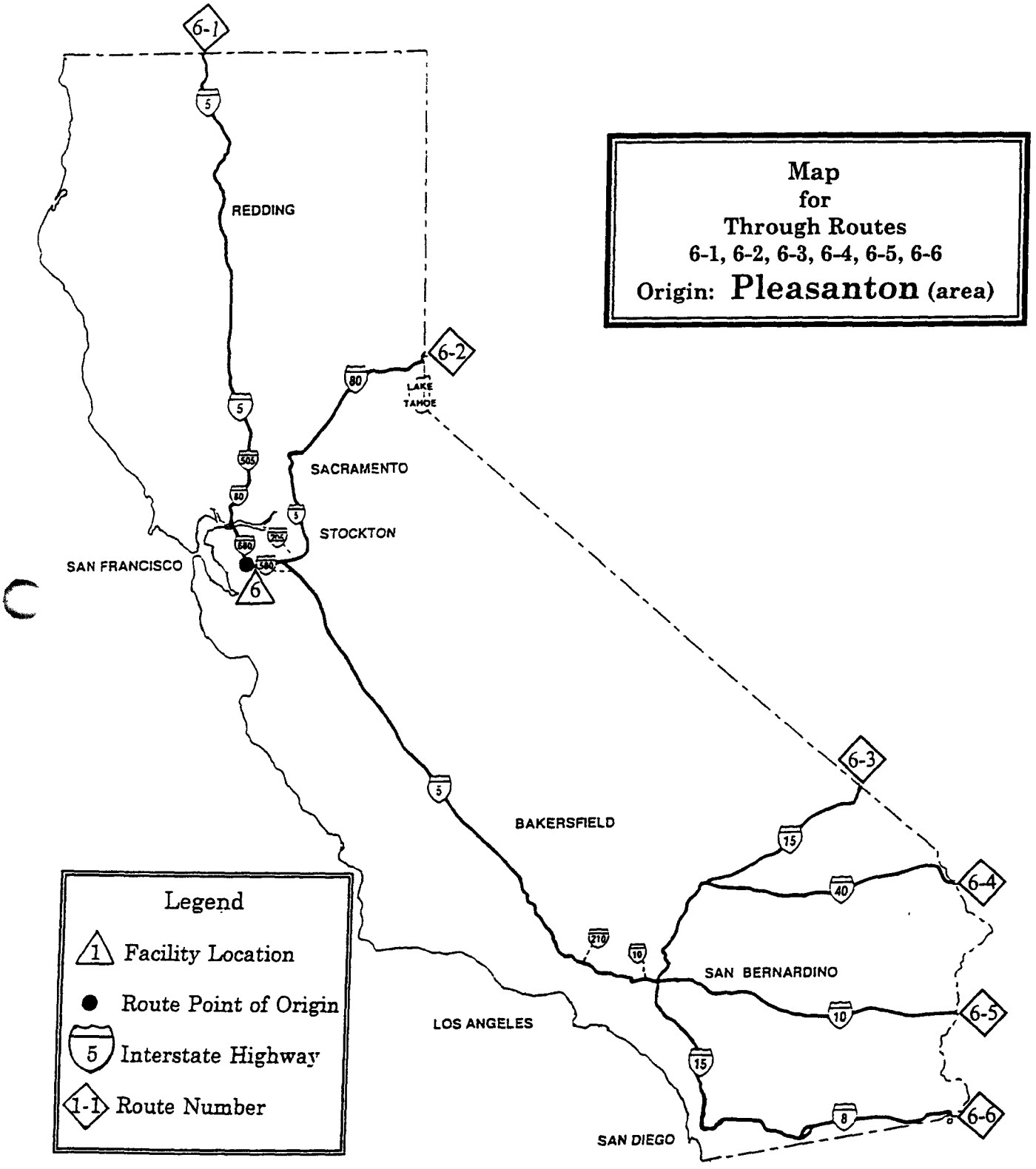
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
5-5	580 5 210 10	East South East East	25.90 284.33 48.78 199.62	558.63	10hr 36min	3,620,659	648.13	.999916	1.85
5-6	580 5 210 10 15 8	East South East East South East	25.90 284.33 48.78 13.99 102.70 167.14	642.84	12hr 11min	4,515,080	702.36	.999913	2.26

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.6 Pleasanton



THROUGH ROUTE ANALYSIS FOR ROUTES 6-1, 6-2, 6-3, 6-4, 6-5, 6-6

Origin: 6. Pleasanton (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
6-1	580	West	1.12	339.48	6hr 27min	887,976	261.57	.999928	0.96
	680	North	40.30						
	80	East	15.93						
	505	North	32.97						
	5	North	249.16						
6-2	580	East	19.17	214.85	4hr 29min	1,652,796	769.28	.999933	0.85
	205	East	12.93						
	5	North	64.54						
	80	East	118.21						
6-3	580	East	34.81	568.14	10hr 49min	3,211,530	565.27	.999916	1.81
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	186.23						
6-4	580	East	34.81	611.04	11hr 23min	3,212,866	525.80	.999914	1.91
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	74.45						
	40	East	154.68						

THROUGH ROUTE ANALYSIS FOR ROUTES 6-1, 6-2, 6-3, 6-4, 6-5, 6-6

Origin: 6. Pleasanton (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

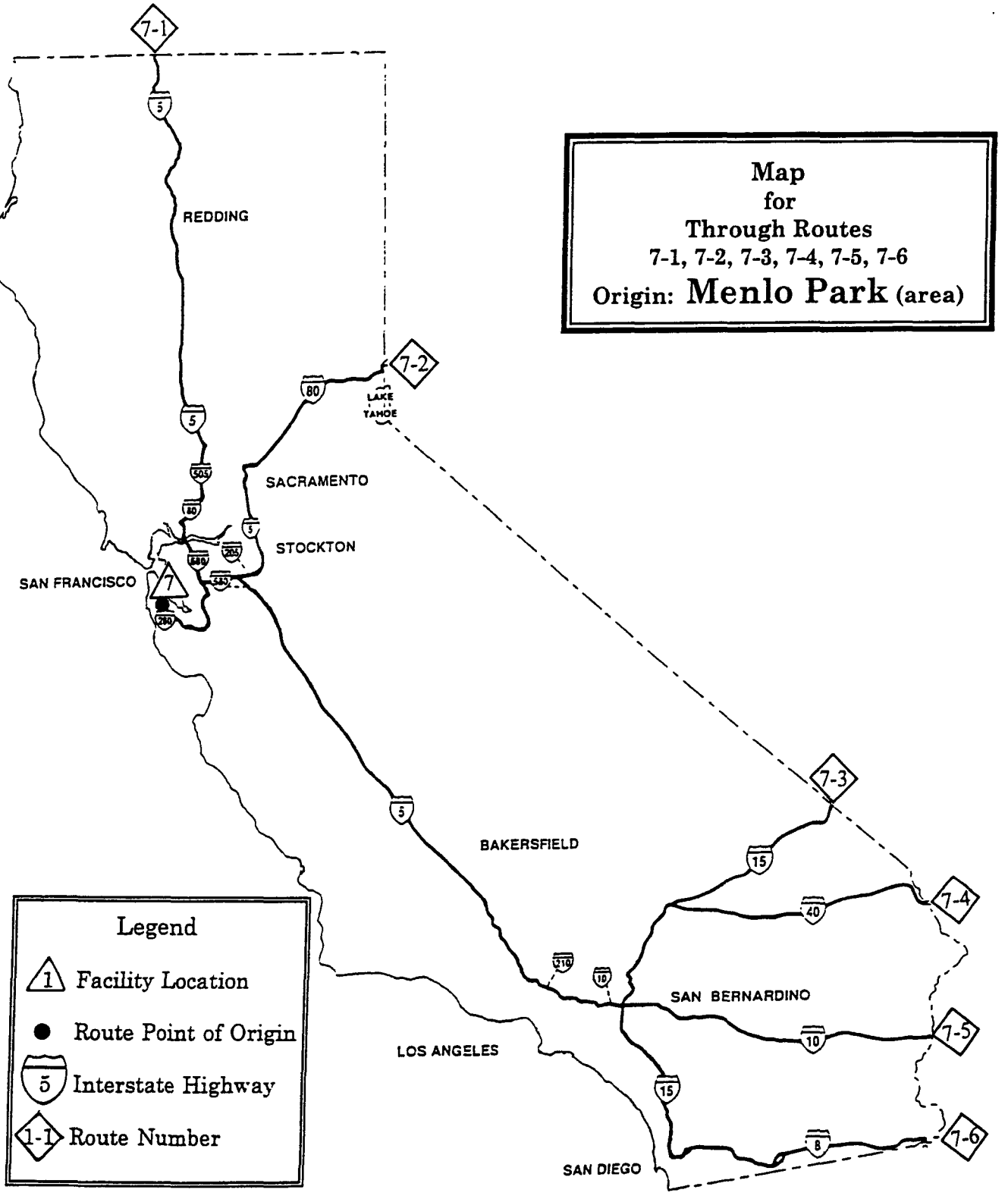
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
6-5	580 5 210 10	East South East East	34.81 284.33 48.78 199.62	567.54	10hr 50min	3,714,539	654.50	.999916	1.85
6-6	580 5 210 10 15 8	East South East East South East	34.81 284.33 48.78 13.99 102.70 167.14	651.75	12hr 25min	4,608,960	707.17	.999913	2.27

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.7 Menlo Park



THROUGH ROUTE ANALYSIS FOR ROUTES 7-1, 7-2, 7-3, 7-4, 7-5, 7-6

Origin: 7. Menlo Park (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
7-1	280 680 80 505 5	South North East North North	18.76 70.34 15.93 32.97 249.16	387.16	7hr 44min	2,275,217	587.67	.999924	1.70
7-2	280 680 580 205 5 80	South North East East North East	18.76 30.04 20.29 12.93 64.54 118.21	264.77	5hr 50min	3,085,535	1165.36	.999926	1.68
7-3	280 680 580 5 210 10 15	South North East South East East North	18.76 30.04 35.93 284.33 48.78 13.99 186.23	618.06	12hr 10min	4, 644,269	751.43	.999914	2.68

THROUGH ROUTE ANALYSIS FOR ROUTES 7-1, 7-2, 7-3, 7-4, 7-5, 7-6

Origin: 7. Menlo Park (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
7-4	280	South	18.76	660.96	12hr 44min	4,645,605	702.86	.999913	2.66
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	74.45						
	40	East	154.68						
7-5	280	South	18.76	617.46	12hr 11min	5,461,545	833.62	.999914	2.72
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	199.62						

THROUGH ROUTE ANALYSIS FOR ROUTES 7-1, 7-2, 7-3, 7-4, 7-5, 7-6

Origin: 7. Menlo Park (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

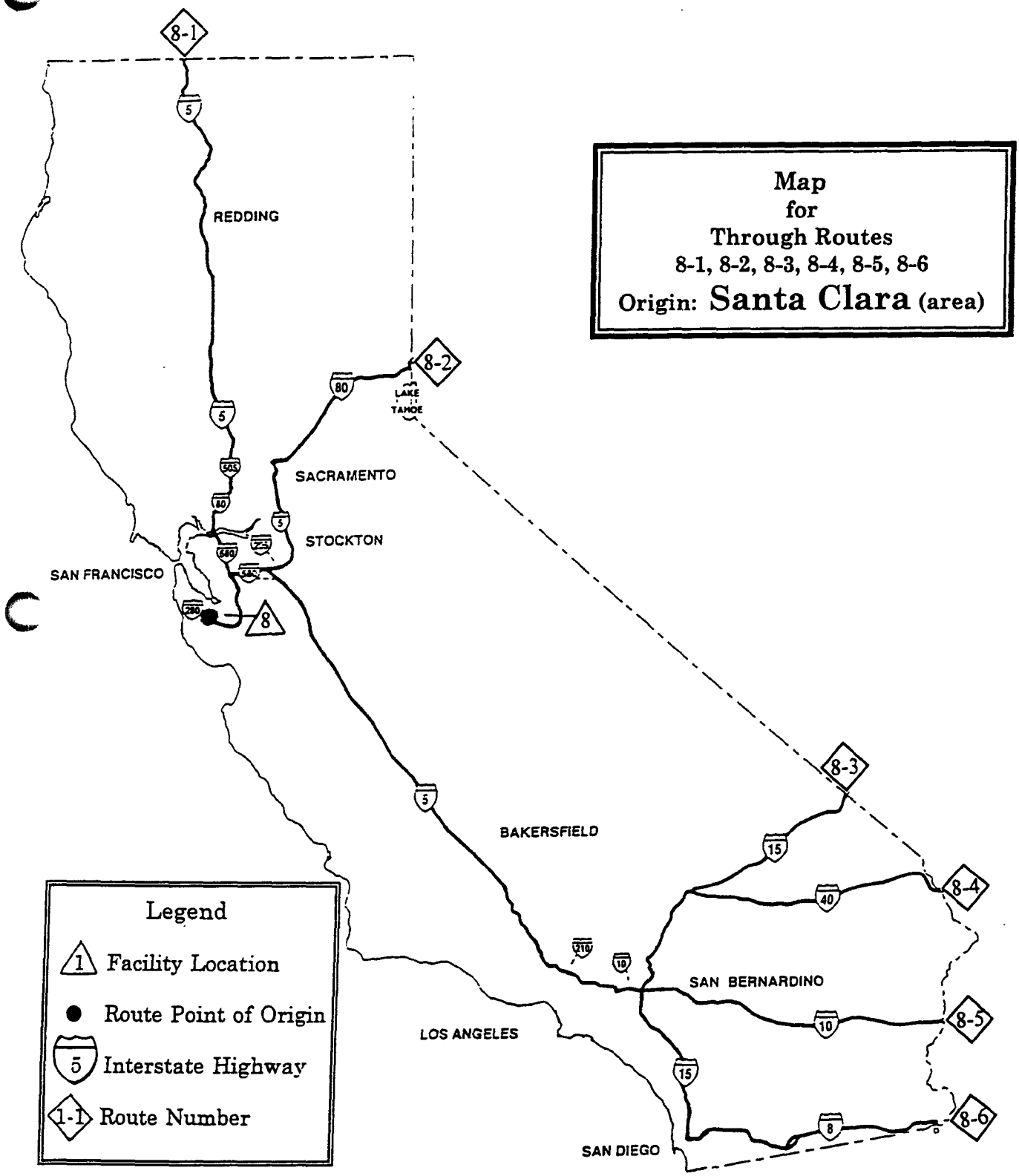
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
7-6	280	South	18.76	701.67	13hr 46min	6,041,699	861.05	.999912	3.14
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.8 Santa Clara



THROUGH ROUTE ANALYSIS FOR ROUTES 8-1, 8-2, 8-3, 8-4, 8-5, 8-6

Origin: 8. Santa Clara (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
8-1	280	South	9.42	377.82	7hr 31min	2,016,256	533.66	.999924	1.59
	680	North	70.34						
	80	East	15.93						
	505	North	32.97						
	5	North	249.16						
8-2	280	South	9.42	255.43	5hr 37min	2,826,574	1106.59	.999927	1.57
	680	North	30.04						
	580	East	20.29						
	205	East	12.93						
	5	North	64.54						
	80	East	118.21						
8-3	280	South	9.42	608.72	11hr 57min	4,385,308	720.41	.999914	2.59
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	186.23						

THROUGH ROUTE ANALYSIS FOR ROUTES 8-1, 8-2, 8-3, 8-4, 8-5, 8-6

Origin: 8. Santa Clara (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
8-4	280	South	9.42	651.62	12hr 31min	4,386,644	673.19	.999913	2.59
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	North	74.45						
	40	East	154.68						
8-5	280	South	9.42	608.12	11hr 58min	4,888,317	803.84	.999914	2.65
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	199.62						

THROUGH ROUTE ANALYSIS FOR ROUTES 8-1, 8-2, 8-3, 8-4, 8-5, 8-6

Origin: 8. Santa Clara (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

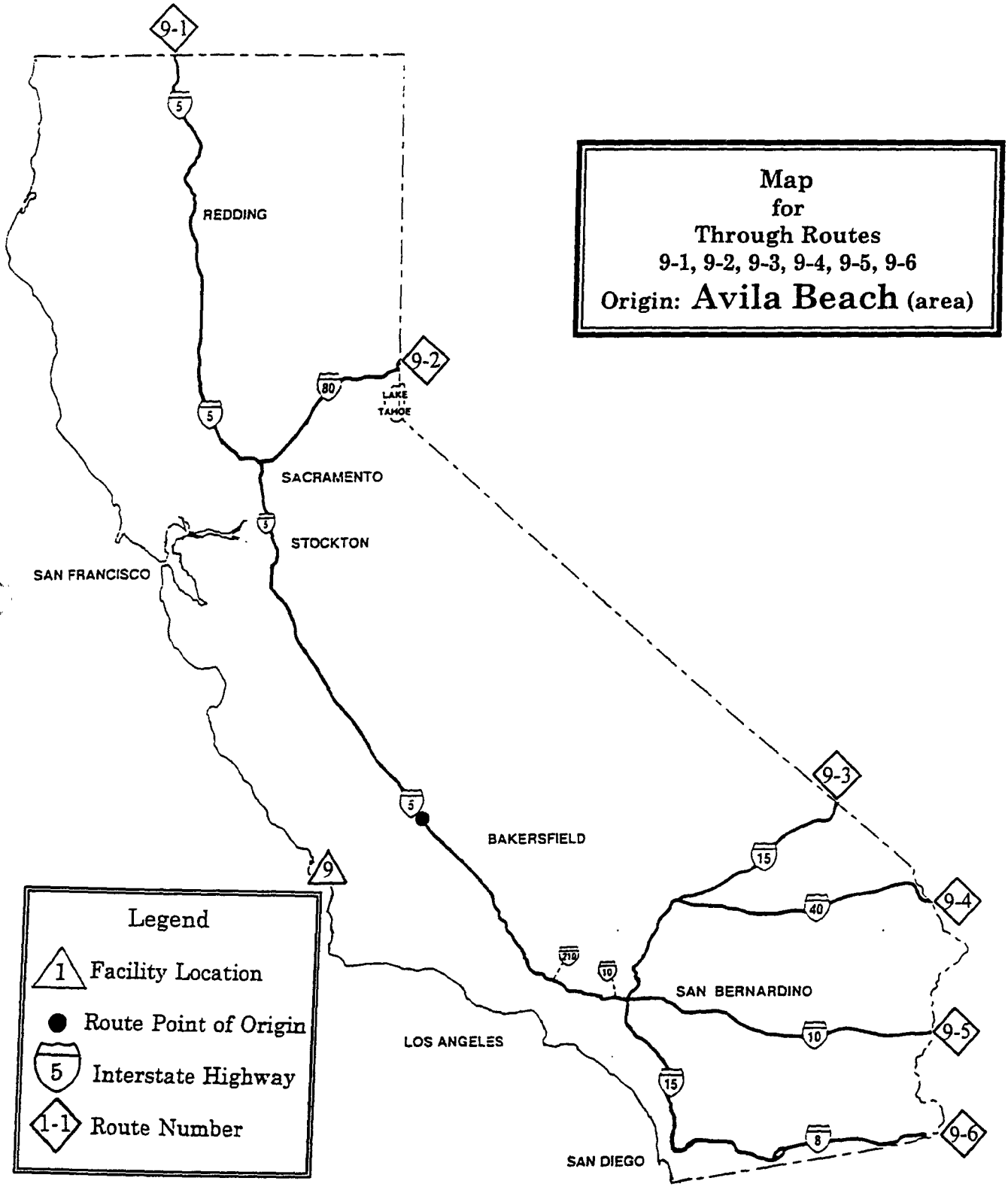
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
8-6	280	South	9.42	692.33	13hr 33min	5,782,738	835.26	.999912	2.94
	680	North	30.04						
	580	East	35.93						
	5	South	284.33						
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.9 Avila Beach



THROUGH ROUTE ANALYSIS FOR ROUTES 9-1, 9-2, 9-3, 9-4, 9-5, 9-6

Origin: 9. Avila Beach (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
9-1	5	North	523.50	523.53	9hr 33min	1,178,973	225.21	.999919	1.31
9-2	5 80	North East	244.99 118.21	363.20	7hr 4min	1,576,246	433.99	.999921	1.16
9-3	5 210 10 15	South East East North	116.29 48.78 13.99 186.23	365.29	6hr.54min	3,024,831	828.06	.999926	1.37
9-4	5 210 10 15 40	South East East North East	116.29 48.78 13.99 74.45 154.68	408.19	7hr 28min	3,026,167	741.36	.999921	1.44
9-5	5 210 10	South East East	116.29 48.78 199.62	364.69	6hr 55min	3,527,840	967.35	.999926	1.44

THROUGH ROUTE ANALYSIS FOR ROUTES 9-1, 9-2, 9-3, 9-4, 9-5, 9-6

Origin: 9. Avila Beach (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

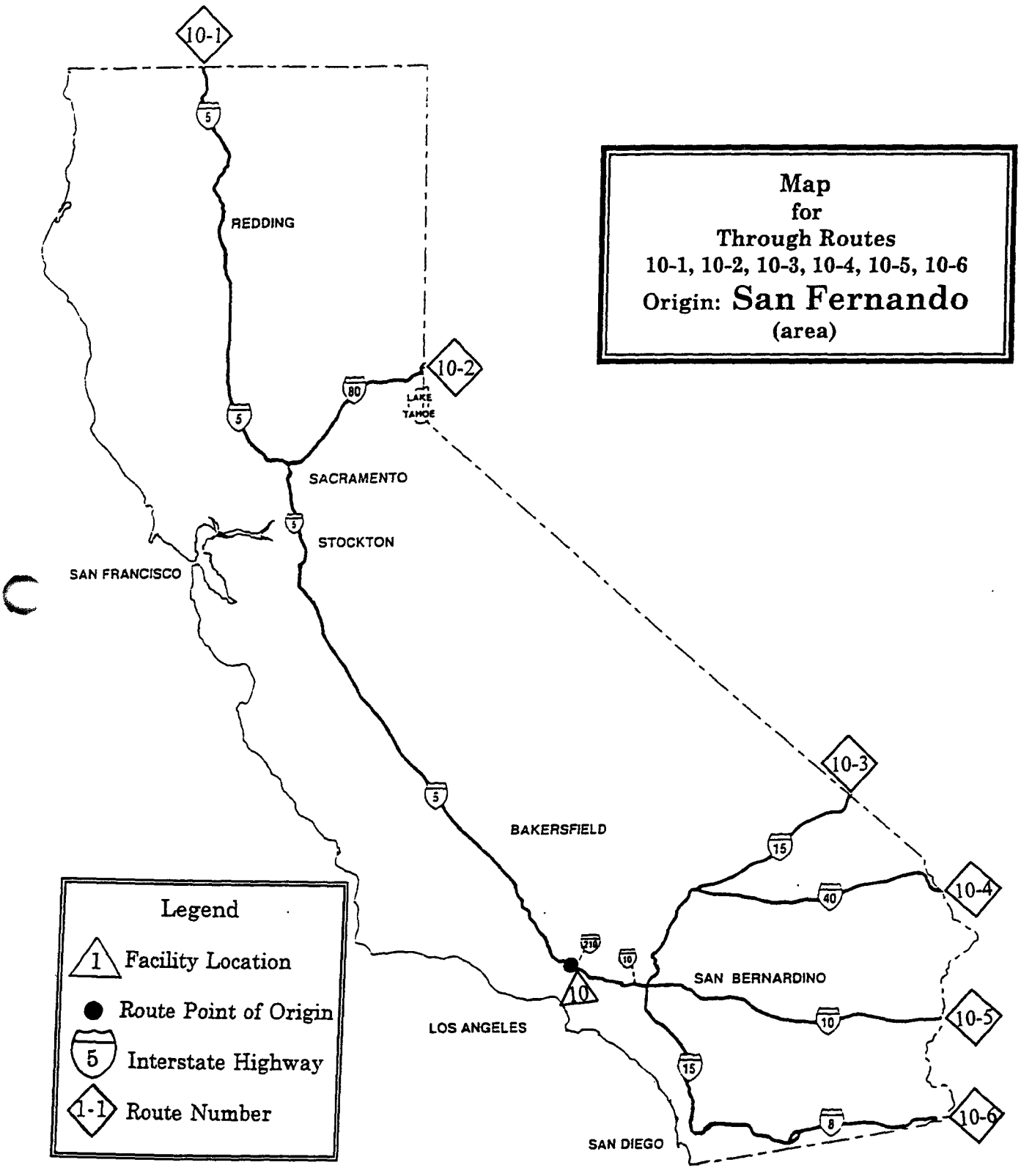
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
9-6	5	South	116.29	448.90	8hr 30min	4,422,261	985.13	.999919	1.81
	210	East	48.78						
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.10 San Fernando



THROUGH ROUTE ANALYSIS FOR ROUTES 10-1, 10-2, 10-3, 10-4, 10-5, 10-6

Origin: 10. San Fernando (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
10-1	210 5	West North	6.07 639.79	645.86	11hr 55min	1,516,324	234.78	.999915	1.60
10-2	210 5 80	West North East	6.07 361.28 118.21	485.56	9hr 25min	1,913,597	394.10	.999916	1.47
10-3	210 10 15	East East North	42.71 13.99 186.23	242.93	4hr 33min	2,678,054	1106.28	.99993	1.06
10-4	210 10 15 40	East East North East	42.71 13.99 74.45 154.68	285.68	5hr 7min	2,688,816	940.70	.999929	1.12
10-5	210 10	East East	42.71 199.62	242.33	4hr 34min	3,190,489	1316.59	.999938	1.12

THROUGH ROUTE ANALYSIS FOR ROUTES 10-1, 10-2, 10-3, 10-4, 10-5, 10-6

Origin: 10. San Fernando (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

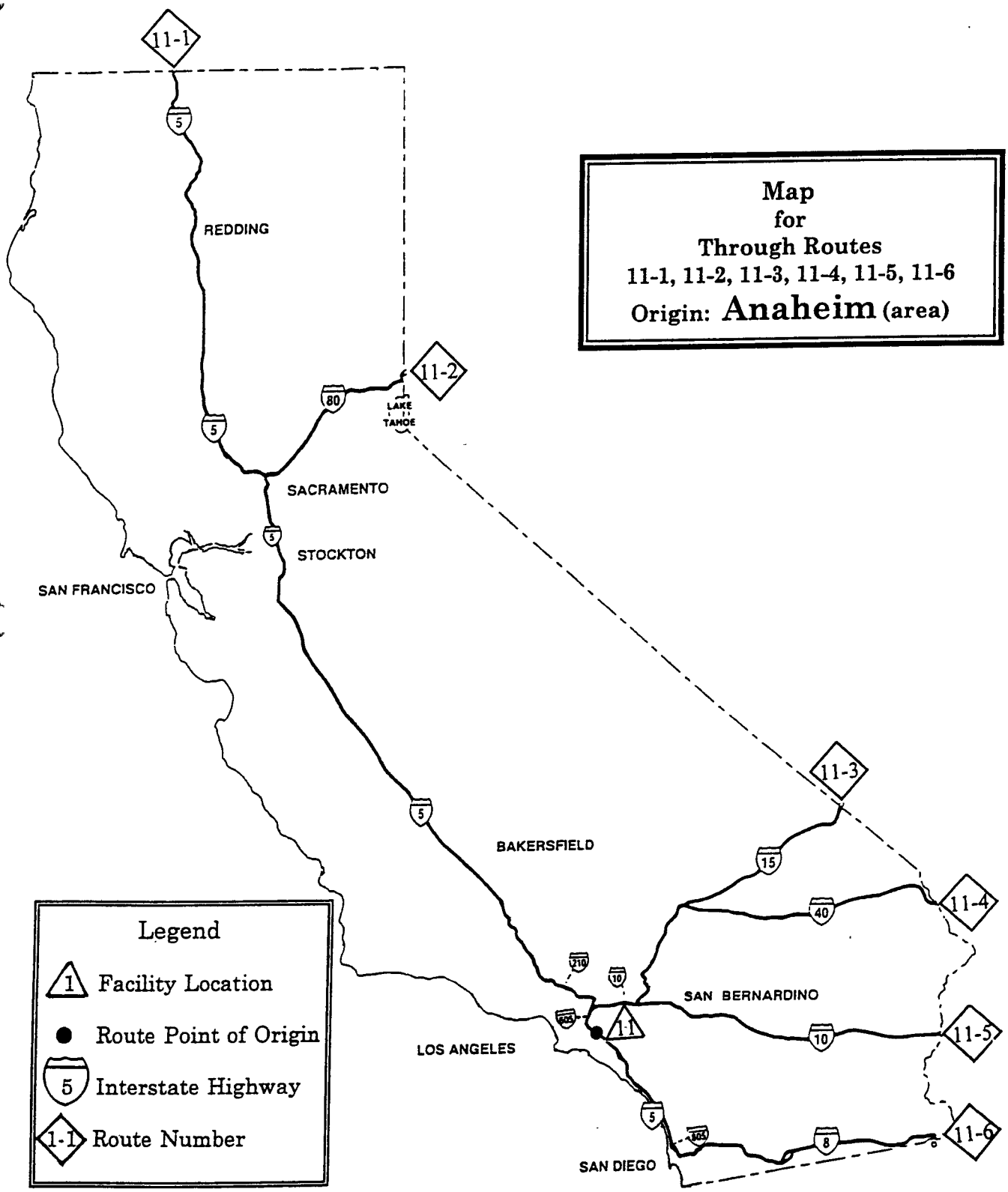
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
10-6	210	East	42.71	326.54	6hr 9min	4,084,910	1250.97	.999926	1.50
	10	East	13.99						
	15	South	102.70						
	8	East	167.14						

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.11 Anaheim



THROUGH ROUTE ANALYSIS FOR ROUTES 11-1, 11-2, 11-3, 11-4, 11-5, 11-6

Origin: 11. Anaheim (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
11-1	5 605 210 5	North North West North	12.38 16.13 36.68 639.79	704.98	13h 24min	4,638,405	657.95	.999913	2.62
11-2	5 605 210 5 80	North North West North East	12.38 16.13 36.68 361.28 118.21	544.68	10hr 54min	5,035,678	924.52	.999914	2.50
11-3	5 605 10 15	North North East North	12.38 10.56 24.83 186.23	234	4hr 25min	3,095,690	1323.94	.999937	1.42
11-4	5 605 10 15 40	North North East North East	12.38 10.56 24.83 74.45 154.68	276.90	4hr 59min	3,097,026	1118.46	.999927	1.48

THROUGH ROUTE ANALYSIS FOR ROUTES 11-1, 11-2, 11-3, 11-4, 11-5, 11-6

Origin: 11. Anaheim (area)

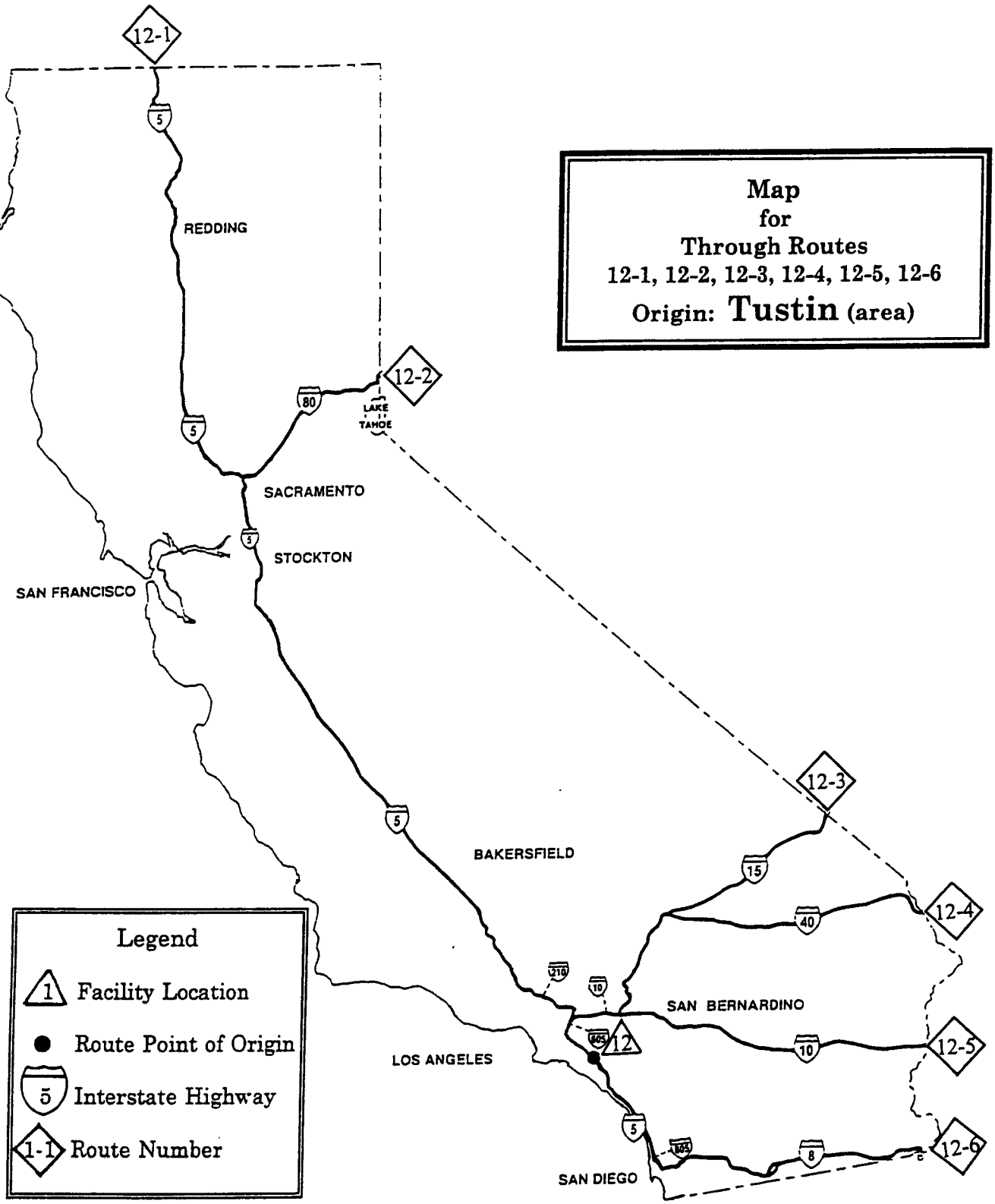
Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
11-5	5 605 10	North North East	12.38 10.56 210.46	233.40	4hr 26min	3,598,699	1541.86	.999936	1.48
11-6	5 805 8	South South East	81.11 10.84 168.84	260.79	5hr 13min	2,807,558	1076.56	.999928	1.40

1. Within a 5 mile bandwidth of along the entire length of the route.
2. Probability of a successful trip.
3. Normalized value of the normal radiation exposure plus risk from a potential release. Values were multiplied by 100.

3.3.12 Tustin


Map
for
Through Routes
12-1, 12-2, 12-3, 12-4, 12-5, 12-6
Origin: Tustin (area)
12-1
12-2
12-3
12-4
12-5
12-6
REDDING
SACRAMENTO
STOCKTON
SAN FRANCISCO
BAKERSFIELD
LOS ANGELES
SAN BERNARDINO
SAN DIEGO
LAKE TAHOE
Legend
Facility Location
Route Point of Origin
Interstate Highway
Route Number

THROUGH ROUTE ANALYSIS FOR ROUTES 12-1, 12-2, 12-3, 12-4, 12-5, 12-6

Origin: 12. Tustin (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
12-1	5 605 210 5	North North West North	21.59 16.13 36.68 639.79	714.19	13hr 39min	5,409,760	757.47	.999913	3.01
12-2	5 605 210 5 80	North North West North East	21.59 16.13 36.68 361.28 118.21	553.89	11hr 10min	5,807,033	1048.41	.999914	2.78
12-3	5 605 10 15	North North East North	21.59 10.56 24.83 186.23	243.21	4hr 40min	3,867,045	1590.00	.999934	1.75
12-4	5 605 10 15 40	North North East North East	21.59 10.56 24.83 74.45 154.68	286.11	5hr 14min	3,868,381	1352.06	.999926	1.80

THROUGH ROUTE ANALYSIS FOR ROUTES 12-1, 12-2, 12-3, 12-4, 12-5, 12-6

Origin: 12. Tustin (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

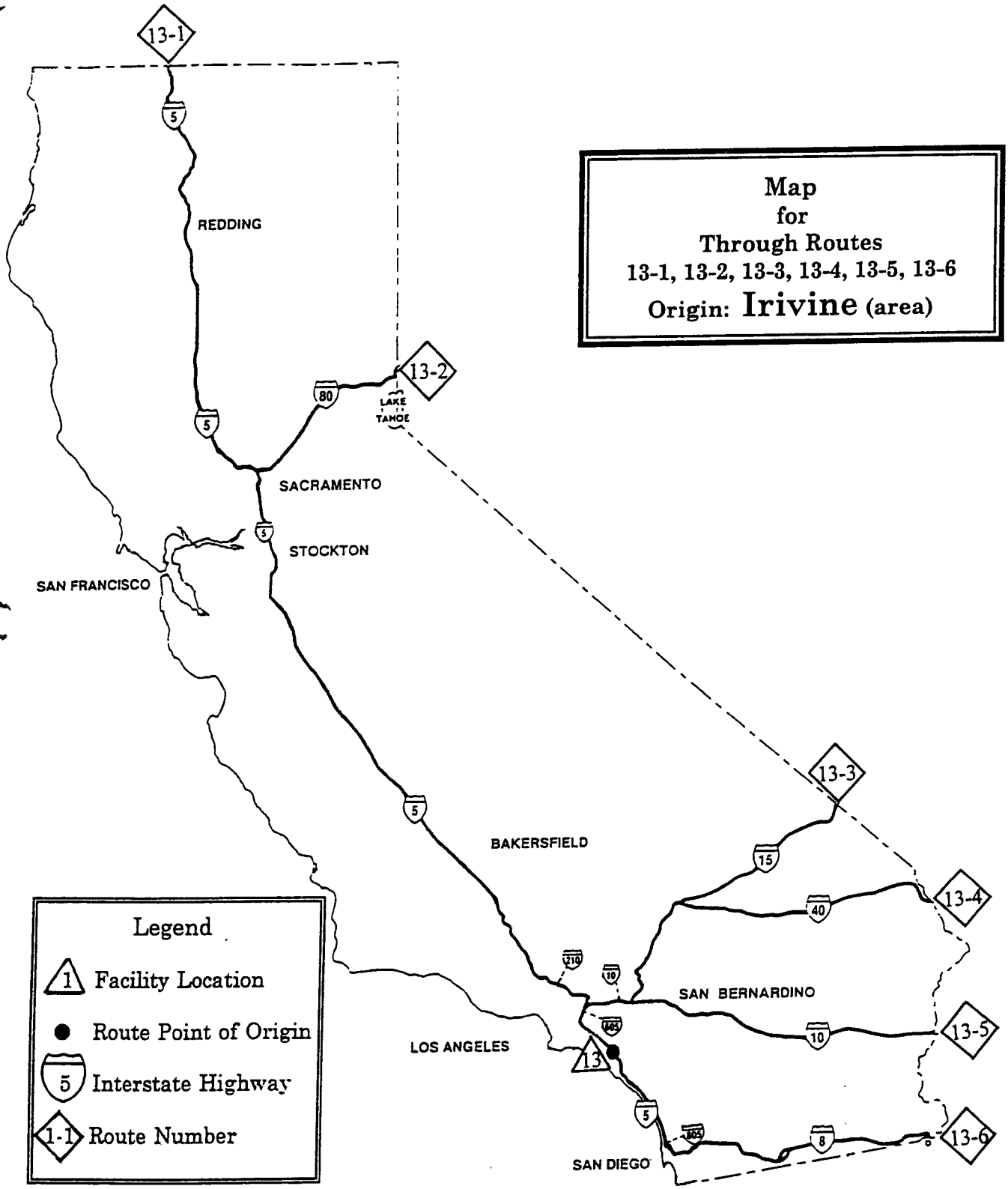
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
12-5	5 605 10	North North East	21.29 10.56 210.46	242.61	4hr 42min	4,370,054	1801.27	.999933	1.80
12-6	5 805 8	South South East	71.90 10.84 168.84	251.58	4hr 58min	2,036,203	809.37	.99992	1.08

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.13 Irvine


Map
for
Through Routes
13-1, 13-2, 13-3, 13-4, 13-5, 13-6
Origin: Irivine (area)
13-1
13-2
13-3
13-4
13-5
13-6
REDDING
SACRAMENTO
STOCKTON
SAN FRANCISCO
LAKE TAHOE
BAKERSFIELD
SAN BERNARDINO
LOS ANGELES
SAN DIEGO
Legend
Facility Location
Route Point of Origin
Interstate Highway
Route Number

THROUGH ROUTE ANALYSIS FOR ROUTES 13-1, 13-2, 13-3, 13-4, 13-5, 13-6

Origin: 13. Irvine (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
13-1	5 605 210 5	North North West North	30.54 16.13 36.68 639.79	723.14	13hr. 55min	5,638,826	777.70	.999913	3.06
13-2	5 605 210 5 80	North North West North East	30.54 16.13 36.68 361.28 118.21	562.84	11hr 25min	6,021,099	1069.77	.999914	2.82
13-3	5 605 10 15	North North East North	30.54 10.56 24.83 186.23	252.16	4hr 56min	4,081,111	1618.46	.999932	1.82
13-4	5 605 10 15 40	North North East North East	30.54 10.56 24.83 74.45 154.68	295.06	5hr 30min	4,082,447	1383.60	.999924	1.88

THROUGH ROUTE ANALYSIS FOR ROUTES 13-1, 13-2, 13-3, 13-4, 13-5, 13-6

Origin: 13. Irvine (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

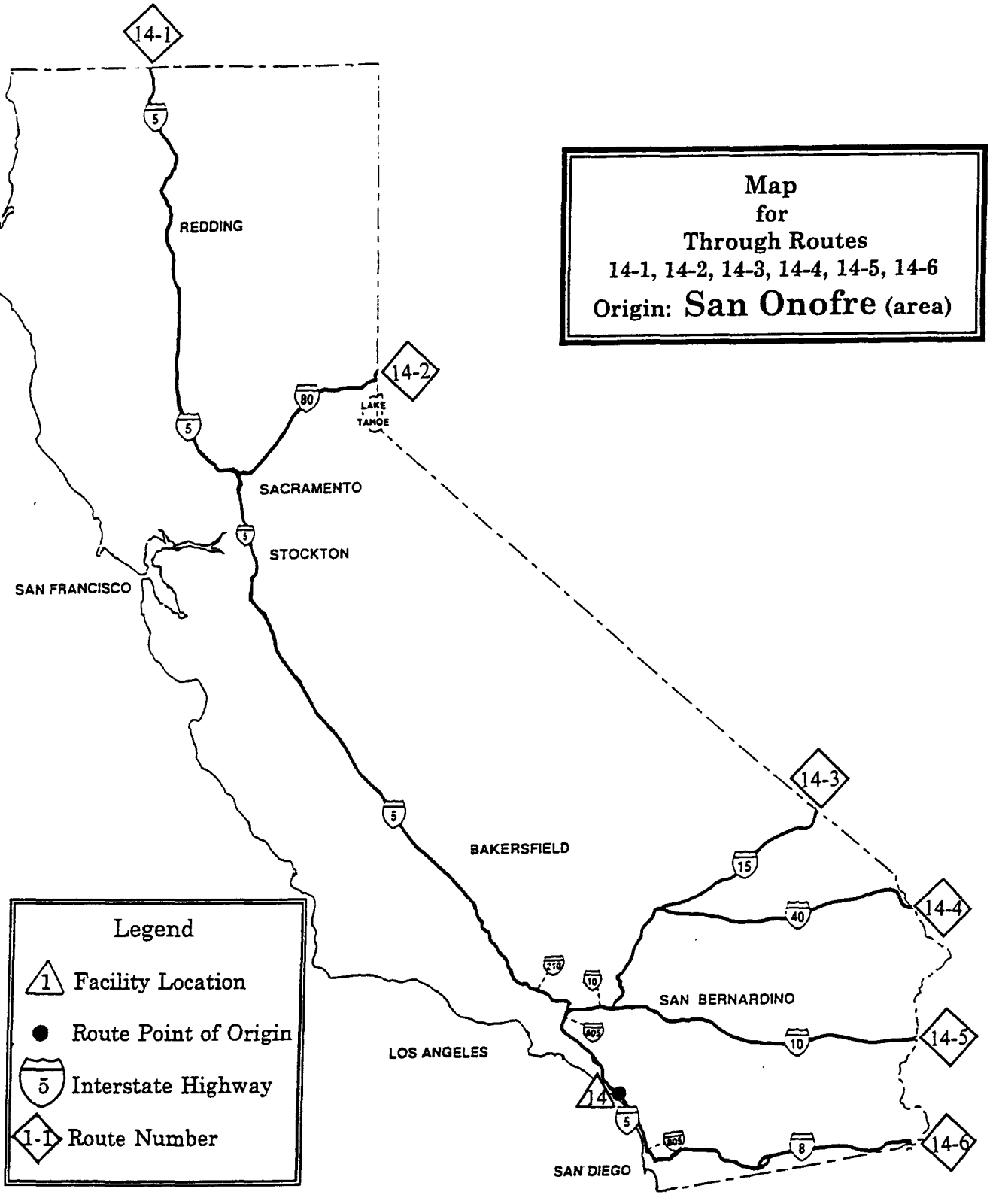
Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
13-5	5 605 10	North North East	30.54 10.56 210.46	251.56	4hr 57min	4,584,120	1822.28	.999932	1.89
13-6	5 805 8	South South East	62.95 10.84 168.84	242.63	4hr 42min	1,822,137	750.99	.999931	1.00

1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.14 San Onefre



THROUGH ROUTE ANALYSIS FOR ROUTES 14-1, 14-2, 14-3, 14-4, 14-5, 14-6

Origin: 14. San Onofre (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
14-1	5 605 210 5	North North West North	52.82 16.13 36.68 639.79	754.42	14hr 31min	5,979,516	802.17	.999912	3.20
14-2	5 605 210 5 80	North North West North East	52.82 16.13 36.68 361.28 118.21	585.12	12hr 1min	6,376,789	1089.83	.999913	1.66
14-3	5 605 10 15	North North East North	52.82 10.56 24.83 186.23	274.44	5hr 32min	4,436,801	1616.67	.999929	1.92
14-4	5 605 10 15 40	North North East North East	52.82 10.56 24.83 74.45 154.68	317.34	6hr 5min	4,438,137	1398.54	.99923	1.99

THROUGH ROUTE ANALYSIS FOR ROUTES 14-1, 14-2, 14-3, 14-4, 14-5, 14-6

Origin: 14. San Onofre (area)

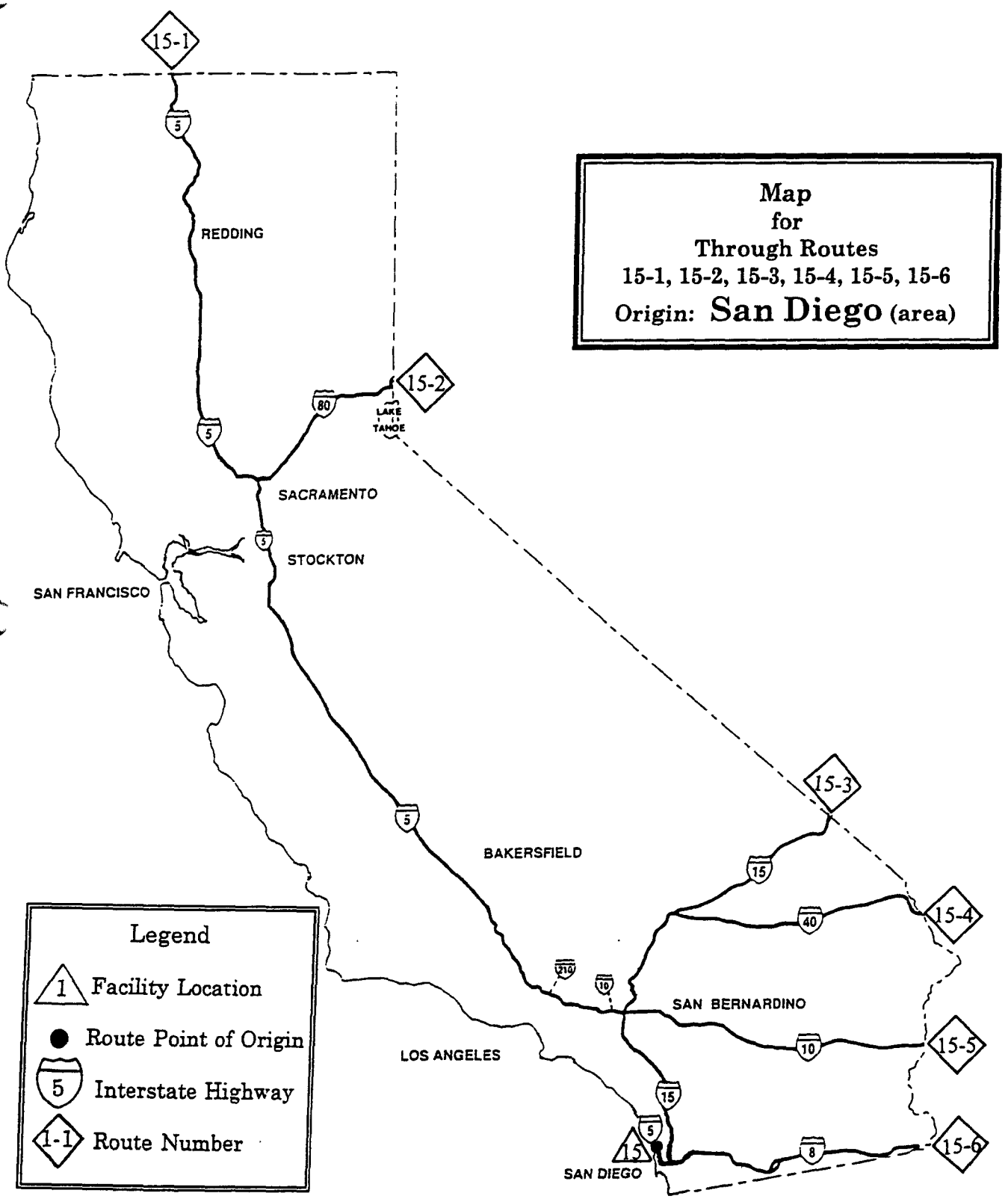
Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
14-5	5 605 10	North North East	52.82 10.56 210.46	273.84	5hr 33min	4,939,810	1803.90	.999929	1.99
14-6	5 805 8	South South East	40.67 10.84 168.84	220.35	4hr 7min	1,466,447	665.51	.999935	0.90

1. Within a 5 mile bandwidth along the entire length of the route.
2. Probability of a successful trip.
3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

3.3.15 San Diego



THROUGH ROUTE ANALYSIS FOR ROUTES 15-1, 15-2, 15-3, 15-4, 15-5, 15-6

Origin: 15. San Diego (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
15-1	5	South	5.87	816.08	15hr 35min	5,542,823	679.20	.999912	3.10
	8	East	4.95						
	15	North	102.70						
	10	West	13.99						
	210	West	48.78						
	5	North	639.79						
15-2	5	South	5.87	655.78	13hr 6min	5,940,096	905.81	.999913	2.98
	8	East	4.95						
	15	North	102.70						
	10	West	13.99						
	210	West	48.78						
	5	North	639.79						
	80	East	118.21						
15-3	5	South	5.87	299.75	5hr 23min	2,051,105	684.27	.999937	1.35
	8	East	4.95						
	15	North	288.93						
15-4	5	South	5.87	342.65	5hr 57min	2,052,441	598.99	.999927	1.42
	8	East	4.95						
	15	North	288.93						
	40	East	154.68						

THROUGH ROUTE ANALYSIS FOR ROUTES 15-1, 15-2, 15-3, 15-4, 15-5, 15-6

Origin: 15. San Diego (area)

Destinations:
1. Interstate 5 at the CA/Oregon Border
2. Interstate 80 at the CA/Nevada Border
3. Interstate 15 at the CA/Nevada Border
4. Interstate 40 at the CA/Arizona Border
5. Interstate 10 at the CA/Arizona Border
6. Interstate 8 at the CA/Arizona Border

ROUTE DIRECTIONS AND DATA

Route	Interstate Highway	Heading	Segment Miles	Total Miles	Estimated Travel Time	Total Population[1]	Pop. Density[1]	Reliability[2]	Risk Index[3]
15-5	5 8 15 10	South East North East	5.87 4.95 102.70 185.63	299.15	5hr 24min	2,554,114	853.79	.999936	1.42
15-6	5 8	South East	5.87 172.09	177.96	3hr 4min	1,397,393	785.23	.99993	1.07

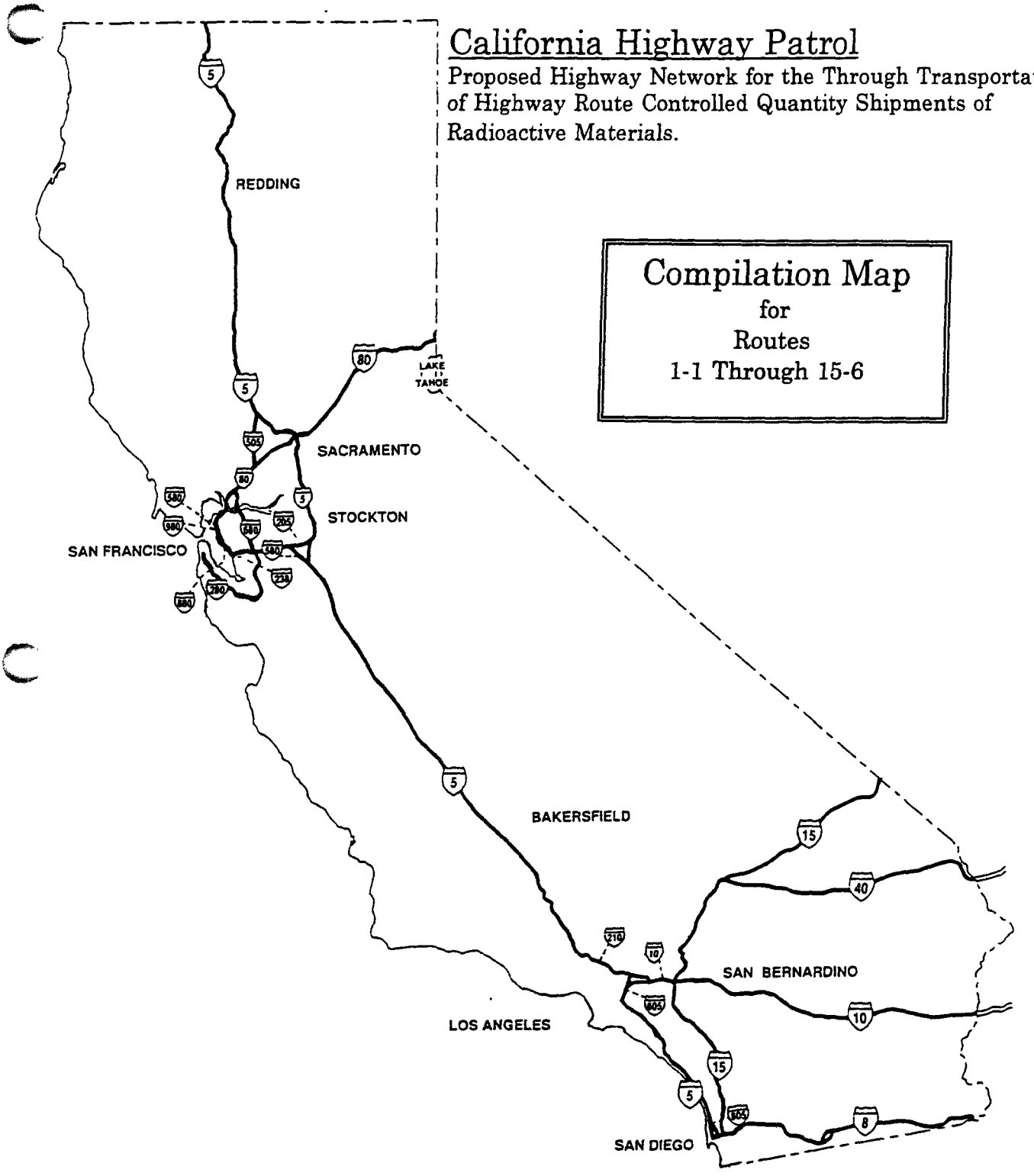
1. Within a 5 mile bandwidth along the entire length of the route.

2. Probability of a successful trip.

3. Normalized value of the normal radiation exposure plus health risk from a potential release. Values were multiplied by 100.

California Highway Patrol

Proposed Highway Network for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials.



4. PROPOSED ROUTING REGULATIONS

4.1 Distribution of Proposed Regulations

In accordance with Section 33000, California Vehicle Code, proposed regulations including maps of proposed routes, have been drafted and forwarded to the Office of Administrative Law. In addition, copies of the proposed regulation package were mailed to affected County Boards of Supervisors, local emergency responders (police, sheriff, fire) along the proposed routes, affected State agencies, adjoining states, consultative meeting attendants, and to citizen and industry representatives on the Interested Parties Mailing List.

4.2 Obtaining Additional Copies

Additional copies of the Notice of Proposed Regulatory Action, Proposed Text and the Initial Statement of Reasons (Annex E) are available by request. Requests to receive copies of this information should be directed to the California Highway Patrol, Hazardous Materials Section by telephone at (916) 327-3310, by fax at (916) 446-4870, or by writing to:

California Highay Patrol
Hazardous Materials Section
ATTN: Routing and Prenotification Unit
P.O. Box 942898
Sacramento, CA 94298-0001.

Annex A EXCERPTS FROM THE CALIFORNIA VEHICLE CODE

DIVISION 13. TOWING AND LOADING EQUIPMENT

CHAPTER 5. TRANSPORTING OTHER LOADS

Article 1. Hazardous Materials

Hazardous Waste and Materials: Transportation Requirements: Penalties

31303. (a) The provisions of this section apply to the highway transportation of hazardous materials and hazardous waste for which the display of placards or markings is required pursuant to Section 27903. This section does not apply to hazardous materials being transported on specified routes pursuant to Section 31616 or 33000.

(b) Unless restricted or prohibited pursuant to Section 31304, the transportation shall be on state or interstate highways which offer the least overall transit-time whenever practicable.

(c) The transporter shall avoid, whenever practicable, congested thoroughfares, places where crowds are assembled, and residence districts as defined in Section 515.

(d) Vehicles used for the transportation shall not be left unattended or parked overnight in a residence district as defined in Section 515.

(e) When transporting hazardous waste pursuant to Section 25169.3 of the Health and Safety Code, all provisions of the waste hauler transportation safety plan, as approved by the Department of Toxic Substances Control, shall be complied with.

(f) Transportation which deviates from the routes required by this section shall not be excused on the basis of operating convenience.

(g) Notwithstanding subdivisions (b) and (c), vehicles engaged in the transportation may also use any of the following highways:

(1) Highways which provide necessary access to local pickup or delivery points consistent with safe vehicle operation.

(2) Highways which provide reasonable access to fuel, repairs, rest, or food facilities that are designed and intended to accommodate commercial vehicle parking, when that access is consistent with safe vehicle operation and when the facility is within one-half road mile of points of entry or exit from the state or interstate highway being used.

(3) Highways restricted or prohibited pursuant to this section when no other lawful alternative exists.

(h) This section shall become operative on January 1, 1987.

Additional Requirements

31304. (a) The transportation of hazardous materials and hazardous waste for which the display of placards or markings is required pursuant to Section 27903 may be restricted or prohibited, by the Department of the California Highway Patrol, after consultation with the Department of Transportation, with regard to state or interstate highways, or by a city or county by ordinance or resolution, after formal notice to the Department of the California Highway Patrol and with the concurrence of their appropriate transportation planning agency defined in Section 29532 of the

Government Code, with regard to specified highways under their control, if all of the following requirements are met:

(1) The respective highway is appreciably less safe than a reasonable alternate highway as determined by using either of the following criteria:

(a) The "Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials" prepared by the Federal Highway Administration (FHWA A-IP-80-15).

(b) The Department of the California Highway Patrol or the city or county, whichever has jurisdiction pursuant to subdivision (a), determines that the respective highway is located within the watershed of a drinking water reservoir which meets all of the following requirements:

(i) The reservoir is owned and operated by a district, as defined in Section 11503 of the Public Utilities Code.

(ii) The reservoir has a capacity of at least 10,000 acre feet.

(iii) The reservoir directly serves a filter plant.

(iv) The reservoir is impounded by a dam, as defined in Section 6002 of the Water Code.

(v) The reservoir's shoreline is located within 500 feet of the highway.

(2) The restriction or prohibition on the use of the highway pursuant to this section is not precluded or preempted by federal law.

(3) The restriction or prohibition does not eliminate necessary access to local pickup or delivery points consistent with safe vehicle operation; does not eliminate reasonable access to fuel, repairs, rest, or food facilities that are designed and intended to accommodate commercial vehicle parking, when that access is consistent with safe vehicle operation and when the facility is within one-half road mile of points of entry or exit from the state or interstate highway being used; or does not restrict or prohibit the use of highways when no other lawful alternative exists.

(4) Written concurrence has been obtained from affected surrounding jurisdictions that the proposed restriction or prohibition is not incompatible with through transportation. If written concurrence is not granted by one of the affected surrounding jurisdictions, that action may be appealed to the appropriate transportation planning agency for final resolution.

(5) The highway is posted by the agency responsible for highway signs on that highway in conformity with standards of the Department of Transportation.

(6) A list of the routes restricted or prohibited is submitted to the Department of the California Highway Patrol.

(7) The highway is included in a list of highways restricted or prohibited pursuant to this section which is published by the Department of the California Highway Patrol and is available to interested parties for not less than 14 days.

(b) Notwithstanding any prohibition or restriction adopted pursuant to subdivision (a), deviation from restricted or prohibited routes is authorized in an emergency or other special circumstances with the concurrence of a member of the agency having traffic law enforcement authority for the highway.

Added Ch. 814, Stats. 1985. Effective January 1, 1987.
Amended Ch. 1049, Stats. 1987. Effective January 1, 1988.

Radioactive Materials

33000. Subject to the provisions of Section 25611 of the Health and Safety Code, the Department of the California Highway Patrol, after consulting with the State Department of Health Services, shall adopt regulations specifying the time at which shipments may occur and the routes which are to be used in the transportation of cargoes of hazardous radioactive materials, as such materials are defined in regulations of the State Department of Health Services.

Spent Radioactive Fuel: Notification

33002. (a) Prior to the transport of any hazardous radioactive materials containing cargoes of commercially produced, spent radioactive fuel outside the confines of a facility where that material was used or stored, or prior to the delivery of these materials to a carrier for transport, each carrier shall provide advance notification, in writing, of the shipment to the Department of the California Highway Patrol, which, in turn, shall notify all of the following persons:

(1) The fire chiefs of each city and county fire department and the fire chiefs of each fire protection district serving a population greater than 15,000, which city, county, or fire protection district is located along the proposed route. The Department of the California Highway Patrol, however, shall only notify those fire chiefs which have requested, in writing, at any time. A fire chief may revoke this request, in writing, at any time.

This paragraph shall not apply to any fire chief of a fire department or fire protection district which is composed of 50 percent or more volunteer firefighters.

(2) The police chiefs of each city where surface transportation would occur along the proposed route.

(b) Subdivision (a) shall apply only to the extent that it does not conflict with federal law.

(c) Each advance notification shall contain the following information:

(1) The name, address, and telephone number of the shipper, carrier, and receiver of the shipment.

(2) If the shipment is originating within California, the point of origin of the shipment and the 48-hour period during which the shipment is estimated to arrive.

(4) A telephone number and address for current shipment information.

(d) The Department of the California Highway Patrol shall design a standard notification form to include all of the information specified in subdivision (c) and shall make these forms available by April 1, 1984.

(e) The notification is required to reach the Department of the California Highway Patrol at least 72 hours before the beginning of the 48-hour period during which departure of the shipment is estimated to occur and the Department of the California Highway Patrol shall notify the fire chiefs who have requested notification and the police chiefs specified in subdivision (a) at least 36 hours before the beginning of this 48-hour period. A copy of the

notification shall be retained by the Department of the California Highway Patrol for three years.

(f) The carrier shall also notify, by telephone or telegram, the Department of the California Highway Patrol if there are any changes in the scheduling of a shipment, in the routes to be used for a shipment, or any cancellation of a shipment. The Department of the California Highway Patrol shall, in turn, notify the fire chiefs who have requested notification and the police chiefs specified in subdivision (a) that would be affected by these changes in the scheduling of a shipment. The Department of the California Highway Patrol shall maintain for three years a record of each telegram and telephonic notification.

(g) Any person or agency that receives any information pursuant to this section shall not disseminate or reveal this information to any other person, state agency, city, county, or local agency unless the person or agency determines that disseminating or revealing this information is necessary to protect the public health and safety or the environment.

(h) The Governor shall appoint the fire chiefs eligible to request notification, as specified in paragraph (1) of subdivision (a), as the designated representatives of the Governor pursuant to paragraph (1) of subsection (c) of Section 73.21 of Title 10 of the Code of Federal Regulations for the purpose of receiving information classified as safeguards information pursuant to Part 73 of Title 10 of the Code of Federal Regulations.

(i) Any carrier who violates this section, in addition to any penalty provided by law, is subject to a civil penalty of not more than five hundred dollars ($500) for each violation. For purposes of this section, each day of a continuing violation is a separate and distinct violation.

When establishing the amount of civil liability pursuant to this subdivision, the court shall consider, in addition to other relevant circumstances, the following:

(1) The extent of the harm caused by the violation.

(2) The persistence of the violation.

(3) The number of prior violations by the same violator.

(4) The deterrent value of the penalty based on the financial resources of the violator.

Annex B EXCERPTS FROM THE CODE OF FEDERAL REGULATIONS

Title 10, Part 71, Subpart F, Sections 71.71 - 71.77

Subpart F--Package and Special Form Tests[2]

§ 71.71 Normal conditions of transport.

(a) *Evaluation.* Evaluation of each package design under normal conditions of transport must include a determination of the effect on that design of the conditions and tests specified in this section. Separate specimens may be used for the free drop test, the compression test, and the penetration test if each specimen is subjected to the water spray test before being subjected to any of the other tests.

(b) *Initial conditions.* With respect to the initial conditions for the tests in this section, the demonstration of compliance with the requirements of this part must be based on the ambient temperature preceding and following the tests remaining constant at that value between -29°C (-20°F) and +38°C (100°F) which is most unfavorable for the feature under consideration. The initial internal pressure within the containment system must be considered to be the maximum normal operating pressure, unless a lower internal pressure consistent with the ambient temperature considered to precede and follow the tests is more unfavorable.

(c) *Conditions and tests-(1) Heat.* An ambient temperature of 38°C (100°F) in still air, and insolation according to the following table:

INSOLATION DATA

Form and location of surface	Total insolation for a 12-hour period (g cal/ cm^2)
Flat surfaces transported horizontally:	
- Base	None.
- Other surface	800.
Flat surfaces not transported horizontally...	200.
Curved surfaces	400.

(2) *Cold.* An ambient temperature of -40°C (-40°F) in still air and shade.

(3) *Reduced external pressure.* An external pressure of 24.5 kilopascal (3.5 psi) absolute.

(4) *Increased external pressure.* An external pressure of 140 kilopascal (20 psi) absolute.

(5) *Vibration.* Vibration normally incident to transport.

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[2]The package standards related to the tests in this subpart are contained in subpart E.

(6) *Water spray.* A water spray that simulates exposure to rainfall of approximately five cm (two in.) per hour for at least one hour.

(7) *Free drop.* Between 1½ and 2½ hours after the conclusion of the water spray test, a free drop through the distance specified below onto a flat, essentially unyielding, horizontal surface, striking the surface in a position for which maximum damage is expected. For Fissile Class II packages, this free drop must be preceded by a free drop from a height of 0.3 m (one ft.) on each corner or, in the case of a cylindrical Fissile Class II package, onto each of the quarters of each rim.

CRITERIA FOR FREE DROP TEST (WEIGHT/DISTANCE)

Package weight		Free drop distance	
Kilograms	Pounds	Meters	Feet
5,000 or less.....	(11,000).....	1.2	(4)
5,000 to 10,000.....	(11,000 to 22,000)...	0.9	(3)
10,000 to 15,000.....	(22,000 to 33,000)...	0.6	(2)
More than 15,000.....	More than 33,000.....	0.3	(1)

(8) *Corner drop.* A free drop onto each corner of the package in succession, or in the case of a cylindrical package onto each quarter of each rim, from a height of 0.3 m (one ft.) onto a flat, essentially unyielding, horizontal surface. This test applies only to fiberboard or wood rectangular packages not exceeding 50 kg (110 pounds) and fiberboard or wood cylindrical packages not exceeding 100 kg (220 pounds).

(9) *Compression.* For packages weighing up to 5000 kg, the package must be subjected, for a period of 24 hours, to a compressive load applied uniformly to the top and bottom of the package in the position in which the package would normally be transported. The compressive load must be the greater of the following:

(i) The equivalent of five times the weight of the package; or

(ii) The equivalent of 12.75 kilopascal (1.85 lb/in^2) multiplied by the vertically projected area of the package.

(10) *Penetration.* Impact of the hemispherical end of a vertical steel cylinder of 3.2 cm (1¼ in) diameter and six kg (13 lb) mass, dropped from a height of one m (40 in) onto the exposed surface of the package which is expected to be most vulnerable to puncture. The long axis of the cylinder must be perpendicular to the package surface.

§ 71.73 Hypothetical accident conditions.

(a) *Test procedures.* Evaluation for hypothetical accident conditions is to be based on sequential application of the tests specified in this section, in the order indicated, to determine their cumulative effect on a package or array of packages. An undamaged specimen must be used for the water immersion test specified in paragraph (c)(5) of this section.

(b) *Test conditions.* With respect to the initial conditions for the tests except for the water immersion tests, to demonstrate compliance with the requirements of this part during testing, the ambient air temperature before and after the tests must remain constant at that value between -29°C (-20°F) and +38°C (100°F)

which is most unfavorable for the feature under consideration. The initial internal pressure within the containment system must be the maximum normal operating pressure unless a lower internal pressure consistent with the ambient temperature assumed to precede and follow the tests is more unfavorable.

(c) *Tests.* Tests for hypothetical accident conditions must be conducted as follows:

(1) *Free Drop.* A free drop of the specimen through a distance of nine m (30 ft) onto a flat, essentially unyielding, horizontal surface, striking the surface in a position for which maximum damage is expected.

(2) *Puncture.* A free drop of the specimen through a distance of one m (40 in) in a position for which maximum damage is expected, onto the upper end of a solid, vertical, cylindrical, mild steel bar mounted on an essentially unyielding, horizontal surface. The bar must be 15 cm (six in) in diameter, with the top horizontal and its edge rounded to a radius of not more than six mm (¼ in) and of a length as to cause maximum damage to the package, but not less than 20 cm (eight in) long. The long axis of the bar must be vertical.

(3) *Thermal.* Exposure of the whole specimen for not less than 30 minutes to a heat flux not less than that of a radiation environment of 800°C (1475°F) with an emissivity coefficient of at least 0.9. For purposes of calculation, the surface absorptivity must be either that value which the package may be expected to possess if exposed to a fire or 0.8, whichever is greater. In addition, when significant, convective heat input must be included on the basis of still, ambient air at 800°C (1475°F). Artificial cooling must not be applied after cessation of external heat input and any combustion of materials of construction must be allowed to proceed until it terminates naturally. The effects of solar radiation may be neglected prior to, during, and following the test.

(4) *Immersion-fissile material.* For fissile material, in those cases where water inleakage has not been assumed for criticality analysis, the specimen must be immersed under a head of water of at least 0.9 m (three ft) for a period of not less than eight hours and in the attitude for which maximum leakage is expected.

(5) *Immersion-all packages.* A separate, undamaged specimen must be subjected to water pressure equivalent to immersion under a head of water of at least 15 m (50 ft) for a period of not less than eight hours. For test purposes, an external pressure of water of 147 kilopascal (21 psi) gauge is considered to meet these conditions.

§ 71.75 Qualification of special form radioactive material.

(a) Evaluation of the contents of a single package for qualification as special form must include a determination of the effect on a specimen of those contents of the tests specified in § 71.77.

(1) Specimens (solid radioactive material or capsules) to be tested must be as normally prepared for loading in a single package, with the radioactive material duplicated as closely as practicable.

(2) A different specimen may be used for each of the tests.

(b) The specimen must not break or shatter when subjected to the impact, percussion, or bending tests.

(c) The specimen must not melt or disperse when subjected to the heat test.

(d) After each test, leak-tightness or indispersibility of the specimen must be determined by a method no less sensitive than the following leaching assessment procedure. For a capsule resistant to corrosion by water, and which has an internal void volume greater than 0.1 milliliters, an alternative to the leaching assessment is a demonstration of leak-tightness of 10^{-4} torr-l/s (1.3×10^{-4} atm cm^3/s) (based on air at 25°C and one atmosphere differential pressure) for solid radioactive content, or 10^{-6} torr-l/s (1.3×10^{-6} atm cm^3/s) for liquid or gaseous radioactive content.

(1) The specimen must be immersed for seven days in water at ambient temperature. The water must have a pH of 6-8 and a maximum conductivity of 10 μmho/cm at 20°C (68°F). Encapsulated material is not subject to the seven-day requirement.

(2) The water with specimen must then be heated to a temperature of 50°±5°C (122°±9°F) and maintained at this temperature for four hours.

(3) The activity of the water must be determined at that time.

(4) The specimen must then be stored for at least seven days in still air of humidity not less than 90% and a temperature not less than 30°C (86°F).

(5) The specimen must then be immersed in water having a pH of 6-8 and a maximum conductivity of 10 μmho/cm at 20°C, and the water with specimen heated to 50°±5°C (122°±9°F) and maintained at this temperature for four hours.

(6) The activity of the water must be determined at that time.

(7) The activities determined in paragraphs (c)(3) and (6) of this section must not exceed 0.05 μCi.

[48 FR 35607, Aug. 5, 1983; 48 FR 38449, Aug. 24, 1983; 48 FR 51903; Nov. 15, 1983]

§ 71.77 Tests for special form radioactive material.

(a) *Impact test.* The specimen must fall onto a flat, horizontal, essentially unyielding surface from a height of not less than nine m (30 ft).

(b) *Percussion test.* The specimen must be placed on a sheet of lead which is supported by a smooth solid surface and struck by the flat face of a steel billet so as to produce an impact equivalent to that resulting from a free fall of 1.4 kg (three lb.) through one m (40 in.). The flat face of the billet must be 25 mm (one in.) in diameter with the edges rounded to a radius of three mm (0.12 in.)±0.3 mm (0.012 in.). The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm (one in.) thick, must cover an area greater than that covered by the specimen. A fresh surface of lead must be used for each impact. The billet must strike the specimen so as to cause maximum damage.

(c) *Bending test.* The test is applicable only to long, slender sources with both a minimum length of 10 cm (four in.) and a length to minimum width ratio not less than 10. The specimen must be rigidly clamped in a horizontal position so that one-half of its length protrudes from the face of the clamp. The orientation of the specimen must be such that the specimen will suffer maximum damage when its free end is struck by the flat face of a steel billet. The billet must strike the specimen so as to produce an

impact equivalent to that resulting from a free vertical fall of 1.4 kg (three lb.) through one m (40 in.). The flat face of the billet must be 25 mm (one in.) in diameter with the edges rounded off to a radius of three mm (0.12 in.)±0.3 mm (0.012 in.).

(d) *Heat test.* The specimen must be heated to a temperature of not less than 800°C (1475°F) in an atmosphere which is essentially air, and held at that temperature for a period of 10 minutes and must then be allowed to cool.

[48 FR 35607, Aug. 5, 1983; 48 FR 38450, Aug. 24, 1983]

Title 49, Part 173, Subpart A, Section 177.825

§ 177.825 Routing and training requirements for Class 7 (radioactive) materials.

(a) Except as provided in paragraph (b) of this section, a carrier or any person operating a motor vehicle that contains a Class 7 (radioactive) material for which placarding is required under part 172 of this subchapter shall-

(1) Ensure that the motor vehicle is operated on routes that minimize radiological risk;

(2) In determining the level of radiological risk, consider available information on accident rates, transit time, population density and activities, and the time of day and the day of week during which transportation will occur, and

(3) Tell the driver which route to take and that the motor vehicle contains Class 7 (radioactive) materials.

The requirements of this paragraph do not apply when there is only one practicable highway route available, considering operating necessity and safety, or when the routing of the motor vehicle is subject to paragraph (b) of this section.

(b) Except as otherwise permitted in this paragraph and in paragraph (e) of this section, a carrier or any person operating a motor vehicle containing a highway route controlled quantity of Class 7 (radioactive) materials, as defined in § 173.403(l) of this subchapter, shall operate the motor vehicle only over preferred routes. Those routes must be selected by the carrier or that person operating a motor vehicle containing a highway route controlled quantity of radioactive materials to reduce time in transit over the preferred route segment of the trip. An Interstate System bypass or Interstate System beltway around a city, when available, shall be used in place of a preferred route through a city, unless a State routing agency has designated an alternative route.

(1) A preferred route is either or both an Interstate System highway for which an alternative route is not designated by a State routing agency as provided in this section, or a State-designated route selected by a State routing agency (see § 171.8 of this subchapter) in accordance with the following conditions:

(i) The State routing agency shall select routes to minimize radiological risk using "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Class 7 (Radioactive) Materials", or an equivalent routing analysis which adequately considers overall risk to the public.

Designations must be preceded by substantive consultation with affected local jurisdictions and with any other affected States to ensure consideration of all impacts and continuity of designated routes.

(ii) State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways, including an Interstate System bypass or an Interstate System beltway.

(iii) A State-designated route is effective when-

(A) The State gives written notice by certified mail, return receipt requested to the Associate Administrator for Hazardous Materials Safety, Research and Special Programs Administration, U.S. Department of Transportation, Washington, DC 20590-0001 (Attention: Registry of State-designated Routes, Docket HM-164A), and

(B) Receipt thereof is acknowledged in writing by the Associate Administrator for Hazardous Materials Safety.

(iv) Upon request, the Dockets Unit will provide a list of State designated preferred routes and a copy of the "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials."

(2) A motor vehicle may be operated over a route, other than a preferred route only under the following conditions:

(i) The deviation from the preferred route is necessary to pick up or deliver a highway route controlled quantity of Class 7 (radioactive) materials, to make necessary rest, fuel or motor vehicle repair stops, or because emergency conditions make continued use of the preferred route unsafe or impossible;

(ii) For pickup and delivery not over preferred routes, the route selected must be the shortest-distance route from the pickup location to the nearest preferred route entry location, and the shortest-distance route to the delivery location from the nearest preferred route exit location. Deviation from the shortest-distance pickup or delivery route is authorized if such deviation:

(A) Is based upon the radiological risk minimization criteria of paragraph (a) of this section, and

(B) Does not exceed the shortest-distance pickup or delivery route by more than 25 miles and does not exceed 5 times the length of the shortest-distance pickup or delivery route.

(iii) Deviations from preferred routes, or pickup or delivery routes other than preferred routes, which are necessary for rest, fuel, or motor vehicle repair stops or because of emergency conditions, shall be made in accordance with the radiological risk minimization criteria of paragraph (a) of this section unless, due to emergency conditions, time does not permit use of those criteria.

(C) A carrier (or his agent) who operates a motor vehicle which contains a package of highway route controlled quantity Class 7 (radioactive) materials as defined in § 173.403(1) of this subchapter shall prepare a written route plan and supply a copy before departure to the motor vehicle driver and a copy to the shipper (before departure for exclusive use shipments, or otherwise within fifteen working days following departure). Any variation between the route plan and routes actually used, and the reason for it, shall be reported in an amendment to the route plan delivered to the shipper as soon as practicable but within 30 days following the deviation. The route plan shall contain:

(1) A statement of the origin and destination points, a route selected in compliance with this section, all planned stops, and estimated departure and arrival times; and

(2) Telephone numbers which will access emergency assistance in each State to be entered.

(d) No person may transport a package of highway route controlled quantity of Class 7 (radioactive) materials, as defined in § 173.403(l) of this subchapter, on a public highway unless:

(1) The driver is trained as required by subpart H of part 172 of this subchapter and § 177.816.

(2) A copy of the record of training required by § 172.704 of this subchapter is in the immediate possession of the driver.

(3) The route plan required in paragraph (c) of this section is in the immediate possession of the driver and the motor vehicle is operated by the driver in accordance with the route plan.

(e) A person may transport irradiated reactor fuel only in compliance with a plan if required under § 173.22(c) of this subchapter that will ensure the physical security of the material. Variation for security purposes from the requirements of this section is permitted so far as necessary to meet the requirements imposed under such a plan, or otherwise imposed by the U.S. Nuclear Regulatory Commission in 10 CFR Part, 73.

(f) Except for packages shipped in compliance with the physical security requirements of the U.S. Nuclear Regulatory Commission in 10 CFR Part 73, each carrier who accepts for transportation a highway route controlled quantity of Class 7 (radioactive) material (see § 173.401(1)), shall, within 90 days following the acceptance of the package, file the following information concerning the transportation of each such package with the Associate Administrator for Hazardous Materials Safety) RSPA:

(1) The route plan required under paragraph (c) of this section, including all required amendments reflecting the routes actually used.

(2) A statement identifying the names and addresses of the shipper, carrier and consignee; and

(3) A copy of the shipping paper or the description of the Class 7 (radioactive material in the shipment required by §§ 172.202 and 172.203 of this subchapter.

Title 49, Part 397, Subpart D, Section 397.101 - 397.103

ROUTING OF CLASS 7 (RADIOACTIVE) MATERIALS

§ 397.101 Requirements for motor carriers and drivers.

(a) Except as provided in paragraph (b) of this section or in circumstances when there is only one practicable highway route available, considering operating necessity and safety, a carrier or any person operating a motor vehicle that contains a Class 7 (radioactive) material, as defined in 49 CFR 172.403, for which placarding is required under 49 CFR part 172 shall:

(1) Ensure that the motor vehicle is operated on routes that minimize radiological risk;

(2) Consider available information on accident rates, transit time, population density and activities, and the time of day and the day of week during which transportation will occur to determine the level of radiological risk; and

(3) Tell the driver which route to take and that the motor vehicle contains Class 7 (radioactive) materials.

(b) Except as otherwise permitted in this paragraph and in paragraph (f) of this section, a carrier or any person operating a motor vehicle containing a highway route controlled quantity of Class 7 (radioactive) materials, as defined in 49 CFR 173.403(1), shall operate the motor vehicle only over preferred routes.

(1) For purposes of this subpart, a preferred route is an Interstate System highway for which an alternative route is not designated by a State routing agency; a State-designated route selected by a State routing agency pursuant to § 397.103; or both of the above.

(2) The motor carrier or the person operating a motor vehicle containing a highway route controlled quantity of Class 7 (radioactive) materials, as defined in 49 CFR 173.403(1) and (y), shall select routes to reduce time in transit over the preferred route segment of the trip. An Interstate System bypass or Interstate System beltway around a city when available, shall be used in place of a preferred route through a city, unless a State routing agency has designated an alternative route.

(c) A motor vehicle may be operated over a route, other than a preferred route, only under the following conditions:

(1) The deviation from the preferred route is necessary to pick up or deliver a highway route controlled quantity of Class 7 (radioactive) materials, to make necessary rest fuel or motor vehicle repair stops or because emergency conditions make continued use of the preferred route unsafe or impossible

(2) For pickup and delivery not over preferred routes, the route selected must be the shortest-distance route from the pickup location to the nearest preferred route entry location, and the shortest-distance route to the delivery location from the nearest preferred route exit location. Deviation from the shortest-distance pickup or delivery route is authorized if such deviation:

(i) Is based upon the criteria in paragraph (a) of this section to minimize the radiological risk and

(ii) Does not exceed the shortest-distance pickup or delivery route by more than 25 miles and does not exceed 5 times the length of the shortest-distance pickup or delivery route.

(iii) Deviations from preferred routes, or pickup or delivery routes other than preferred routes, which are necessary for rest fuel, or motor vehicle repair stops or because of emergency conditions, shall be made in accordance with the criteria in paragraph (a) of this section to minimize radiological risk unless due to emergency conditions, time does not permit use of those criteria.

(d) A carrier (or a designated agent) who operates a motor vehicle which contains a package of highway route controlled quantity of Class 7 (radioactive) materials, as defined in 49 CFR 173.403(1) shall prepare a written route plan and supply a copy before departure to the motor vehicle driver and a copy to the shipper (before departure for exclusive use shipments as defined in 49 CFR 173.403(i), or within fifteen working days following departure for all other shipments). Any variation between the route plan and routes actually used, and the reason for it, shall be reported in an amendment to the route plan delivered to the shipper as soon as practicable but within 30 days following the deviation. The route plan shall contain:

(1) A statement of the origin and destination points a route selected in compliance with this section, all planned stops, and estimated departure and arrival times, and

(2) Telephone numbers which will access emergency assistance in each State to be entered.

(e) No person may transport a package of highway route controlled quantity of Class 7 (radioactive) materials on a public highway unless:

(1) The driver has received within the two preceding years, written training on:

(i) Requirements in 49 CFR parts 172,173, and 177 pertaining to the Class 7 (radioactive) materials transported;

(ii) The properties and hazards of the Class 7 (radioactive) materials being transported; and

(iii) Procedures to be followed in case of an accident or other emergency.

(2) The driver has in his or her immediate possession a certificate of training as evidence of training required by this section and a copy is placed in his or her qualification file (see § 391.51 of this subchapter), showing:

(i) The driver's name and operator's license number;

(ii) The dates training was provided

(iii) The name and address of the person providing the training;

(iv) That the driver has been trained in the hazards and characteristics of highway route controlled quantity of Class 7 (radioactive) materials; and

(v) A statement by the person providing the training that information on the certificate is accurate.

(3) The driver has in his or her immediate possession the route plan required by paragraph (d) of this section and operates the motor vehicle in accordance with the route plan.

(f) A person may transport irradiated reactor fuel only in compliance with a plan if required under 49 CFR 173.22(c) that will ensure the physical security of the material. Variation for security purposes from the requirements of this section is permitted so far as necessary to meet the requirements imposed under such a plan or otherwise imposed by the U.S. Nuclear Regulatory Commission in 10 CFR part 73.

(g) Except for packages shipped in compliance with the physical security requirements of the U.S. Nuclear Regulatory Commission in 10 CFR part 73, each carrier who accepts for transportation a highway route controlled quantity of Class 7 (radioactive) material (see 49 CFR 173.401(1)), shall, within 90 days following the acceptance of the package file the following information concerning the transportation of each such package with the Associate Administrator for Safety and System Applications, Federal Highway Administration, Attn: Traffic Control Division, HHS-32, room 3419 400 Seventh Street, SW., Washington, DC 20590-0001:

(1) The route plan required under paragraph (d) of this section, including all required amendments reflecting the routes actually used;

(2) A statement identifying the names and addresses of the shipper, carrier and consignee; and

(3) A copy of the shipping paper or the description of the Class 7 (radioactive) material in the shipment required by 49 CFR 172.202 and 172.203.

§ 397.103 Requirements for State routing designations.

(a) The State routing agency, as defined in § 397.201 (c), shall select routes to minimize radiological risk using "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials," or an equivalent routing analysis which adequately considers overall risk to the public. Designations must be preceded by substantive consultation with affected local jurisdictions and with any other affected States to ensure consideration of all impacts and continuity of designated routes .

(b) State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways, including interstate system bypasses, or Interstate System beltways.

(c) A State-designated route is effective when-

(1) The State gives written notice by certified mail, return receipt requested, to the Associate Administrator for Safety and System Applications, Federal Highway Administration, Attn: Traffic Control Division, HHS-32, Room 3419, Registry of State-designated routes, at the address above; and

(2) Receipt thereof is acknowledged in writing by the Associate Administrator.

(d) Upon request, the Office of Highway Safety, Traffic Control Division, HHS-32, room 3419, at the address above, will provide a list of State-designated preferred routes and a copy of the "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials."

Title 49, Part 397, Subpart E, Sections 397.201 - 397.223

PREEMPTION PROCEDURES

§ 397.201 Purpose and scope of the procedures.

(a) This subpart prescribes procedures by which:

(1) Any person, including a State, political subdivision thereof, or Indian Tribe, directly affected by any highway routing designation for hazardous materials may apply to the Federal Highway Administration (FHWA) for a determination as to whether that highway routing designation is preempted under section 105(b) or section 112(a)(1) or (a)(2) of the Act (49 App. U.S.C. 1804 and 1811) or regulations issued thereunder, and

(2) A State, political.subdivision thereof, or Indian tribe may apply for a waiver of preemption with respect to any highway routing designation that the State, political subdivision thereof, or Indian Tribe acknowledges to be preempted by section 1 05(b) or section 112(a)(1) or (a)(2) of the Act or regulations issued thereunder, or that has been determined by a court of competent jurisdiction to be so preempted.

(b) Unless otherwise ordered by the Administrator, an application for a preemption determination which includes an application for a waiver of preemption will be treated and processed solely as an application for a preemption determination.

(c) For purposes of this part:

Act means the Hazardous Materials Transportation Act, 49 U.S.C. App. 1801 et seq., as amended by the Hazardous Materials Transportation Uniform Safety Act of 1990, Pub. L. 101-615.

Administrator means the Administrator of the Federal Highway Administration a model agency of the United States Department of Transportation.

Person means an individual, firm, copartnership, corporation, company, association, joint-stock association, including any trustee, receiver, assignee, or similar representative thereof, or government, Indian tribe, or agency or instrumentality of any government or Indian tribe when it offers hazardous materials for transportation in commerce or transports hazardous materials in furtherance of a commercial enterprise, but such term does not include the United States Postal Service.

Political subdivision includes a municipality; a public agency or other instrumentality of one or more States, or a public corporation, board, or commission established under the laws of one or more States.

Routing agency means the State highway agency or other State agency designated by an Indian tribe, to supervise, coordinate, and approve the highway routing designations for that State or Indian tribe. Any highway routing designation made by a political subdivision of a State shall be considered a designation made by that State.

Routing designation includes any regulation, limitation, or restriction which would have the effect of restricting or prohibiting the transportation of hazardous materials over a highway route, a specific portion of a route, or during a specific time period.

State means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Commonwealth of the Northern Mariana Islands, the Virgin Islands, American Samoa, Guam, or any other territory or possession of the United States designated by the Secretary.

§ 397.203 Standards for determining preemption.

(a) Any highway routing designation established, maintained, or enforced by a State, political subdivision thereof, or Indian tribe is preempted if—

(1) Compliance with both the highway routing designation and any requirement under the Act or of a regulation issued under the Act is not possible;

(2) The highway routing designation as applied or enforced creates an obstacle to the accomplishment and execution of the Act or the regulations issued under the Act; or

(3) It is preempted under the Act.

(b) [Reserved]

§ 397.205 Preemption application.

(a) Any person, including a State, political subdivision thereof, or Indian tribe directly affected by any highway routing designation of another State, political subdivision, or Indian tribe, may apply to the Administrator for a determination of whether that highway routing designation is preempted by the Act or § 397.203 of this subpart. The Administrator shall publish notice of the application in the Federal Register.

(b) Each application filed under this section for a determination must:

(1) Be submitted to the Administrator, Federal Highway Administration, U.S. Department of Transportation, Washington, DC 20590-0001. Attention: HCC-10 Docket Room, Hazardous Materials Preemption

(2) Set forth a detailed description of the highway routing designation of the State, political subdivision thereof, or Indian tribe for which the determination is sought

(3) If applicable, specify the provisions of the Act or the regulations issued under the Act under which the applicant seeks preemption of the highway routing designation of the State, political subdivision thereof, or Indian tribe;

(4) Explain why the applicant believes the highway routing designation of the State, political subdivision thereof, or Indian tribe should or should not be preempted under the standards of § 397.203; and

(5) State how the applicant is affected by the highway routing designation of the State, political subdivision thereof, or Indian tribe.

(c) The filing of an application for a determination under this section does not constitute grounds for noncompliance with any requirement of the Act or any regulation issued under the Act.

(d) Once the Administrator has published notice in the Federal Register of an application received under paragraph (a) of this section, no applicant for such determination may seek relief with respect to the same or substantially the same issue in any court until final action has been taken on the application or until 180 days after filing of the application whichever occurs first. Nothing in this section shall be construed as prohibiting any person, including a State, political subdivision thereof, or Indian tribe, directly affected by any highway routing designation from seeking a determination of preemption in any court of competent jurisdiction in lieu of applying to the Administrator under paragraph (a) of this section.

§ 397.207 Preemption notice.

(a) If the applicant is other than a State, political subdivision thereof, or Indian tribe, the applicant shall mail a copy of the application to the State, political subdivision thereof, or Indian tribe concerned, accompanied by a statement that comments may be submitted regarding the application to the Administrator within 45 days. The application filed with the Administrator must include a certification that the applicant has complied with this paragraph and must include the names and addresses of each official to whom a copy of the application was sent.

(b) The Administrator may afford interested persons an opportunity to file written comments on the application by serving notice on any persons readily identifiable by the Administrator as persons who will be affected by the ruling sought or by publication in the Federal Register.

(c) Each person submitting written comments to the Administrator with respect to an application filed under this section shall send a copy of the comments to the applicant and certify to the Administrator that he or she has complied with this requirement. The Administrator may notify other persons participating in the proceeding of the comments and provide an opportunity for those other Persons to respond.

§ 397.209 Preemption processing.

(a) The Administrator may initiate an investigation of any statement in an application and utilize in his or her evaluation any relevant facts obtained by that investigation. The Administrator may solicit and accept submissions from third

persons relevant to an application and will provide the applicant an opportunity to respond to all third person submissions. In evaluating an application, the Administrator may consider any other source of information. The Administrator may convene a hearing or conference, if a hearing or conference will advance the evaluation of the application.

(b) The Administrator may dismiss the application without prejudice if:

(1) He or she determines that there is insufficient information upon which to base a determination; or

(2) He or she requests additional information from the applicant and it is not submitted.

§ 397.211 Preemption determination.

(a) Upon consideration of the application and other relevant information received, the Administrator issues a determination.

(b) Notwithstanding that an application for a determination has not been filed under § 397.205, the Administrator, on his or her own initiative, may issue a determination as to whether a particular highway routing designation of a State, political subdivision thereof, or Indian tribe is preempted under the Act or the regulations issued under the Act.

(c) The determination includes a written statement setting forth the relevant facts and the legal basis for the determination, and provides that any person aggrieved thereby may file a petition for reconsideration within 20 days in accordance with §397.223.

(d) Unless the determination is issued pursuant to paragraph (b) of this section, the Administrator serves a copy of the determination upon the applicant. In all preemption determinations, the Administrator serves a copy of the determination upon any other person who participated in the proceeding or who is readily identifiable by the Administrator as affected by the determination. A copy of each determination is placed on file in the public docket. The Administrator may publish the determination or notice of the determination in the Federal Register.

(e) If no petition for reconsideration is filed within 20 days in accordance with § 397.223, a determination issued under this section constitutes the final agency decision as to whether a particular highway routing designation of a State, political subdivision thereof, or Indian tribe is preempted under the Act or regulations issued thereunder. The fact that a determination has not been issued under this section with respect to a particular highway routing designation of a State, political subdivision thereof, or Indian tribe carries no implication as to whether the requirement is preempted under the Act or regulations issued thereunder.

§ 397.213 Waiver of preemption application.

(a) Any State, political subdivision thereof, or Indian tribe may apply to the Administrator for a waiver of preemption with respect to any highway routing designation that the State, political subdivision thereof, or Indian tribe acknowledges to be preempted by the Act, § 397.203 of this subpart, or a court of competent jurisdiction. The Administrator may waive preemption with respect to such requirement upon a determination that such requirement-

(1) Affords an equal or greater level of protection to the public than is afforded by the requirements of the Act or regulations issued under the Act, and

(2) Does not unreasonably burden commerce.

(b) Each application filed under this section for a waiver of preemption determination must:

(1) Be submitted to the Administrator, Federal Highway Administration, U.S. Department of Transportation, Washington, DC 20590-0001. Attention: HCC-10 Docket Room, Hazardous Materials Preemption Docket;

(2) Set forth a detailed description of the highway routing designation of the State, political subdivision thereof, or Indian tribe for which the determination is being sought;

(3) Include a copy of any relevant court order or determination issued pursuant to § 397.211;

(4) Contain an express acknowledgment by the applicant that the highway routing designation of the State, political subdivision thereof, or Indian tribe is preempted under the Act or the regulations issued under the Act, unless it has been so determined by a court of competent jurisdiction or in a determination issued under this subpart

(5) Specify each provision of the Act or the regulations issued under the Act that preempts the highway routing designation of the State, political subdivision thereof, or Indian tribe;

(6) State why the applicant believes that the highway routing designation of the State, political subdivision thereof, or Indian tribe, affords an equal or greater level of protection to the public than is afforded by the requirements of the Act or the regulations issued under the Act;

(7) State why the applicant believes that the highway routing designation of the State, political subdivision thereof, or Indian tribe does not unreasonably burden commerce; and

(8) Specify what steps the State, political subdivision thereof, or Indian tribe is taking to administer and enforce effectively the preempted requirement.

§ 397.215 Waiver notice.

(a) The applicant State, political subdivision thereof, or Indian tribe shall mail a copy of the application and any subsequent amendments or other documents relating to the application to each person whom the applicant reasonably ascertains will be affected by the determination sought. The copy of the application must be accompanied by a statement that the person may submit comments regarding the application to the Administrator within 45 days. The application filed with the Administrator must include a certification with the application has complied with this paragraph and must include the names and addresses of each person to whom the application was sent.

(b) Notwithstanding the provisions of paragraph (a) of this section, if the State, political subdivision thereof, or Indian tribe determines that compliance with paragraph (a) of this section would be impracticable, the applicant shall:

(1) Comply with the requirements of paragraph (a) of this section with regard to those persons whom it is reasonable and practicable to notify, and

(2) Include with the application filed with the Administrator a description of the persons or class or classes of persons to whom notice was not sent.

(c) The Administrator may require the applicant to provide notice in addition to that required by paragraphs (a) and (b) of this section, or may determine that the notice required by paragraph (a) of this section is not impracticable, or that notice should be published in the Federal Register.

(d) The Administrator may serve notice on any other persons readily identifiable by the Administrator as persons who will be affected by the determination sought and may afford those persons an opportunity to file written comments on the application.

(e) Any person submitting written comments to the Administrator with respect to an application filed under this section shall send a copy of the comments to the applicant. The person shall certify to the Administrator that he or she has complied with the requirements of this paragraph. The Administrator may notify other persons participating in the proceeding of the comments and provide an opportunity for those other persons to respond.

§ 397.217 Waiver processing.

(a) The Administrator may initiate an investigation of any statement in an application and utilize any relevant facts obtained by that investigation. The Administrator may solicit and accept submissions from third persons relevant to an application and will provide the applicant an opportunity to respond to all third person submissions. In evaluating an application, the Administrator may convene a hearing or conference, if a hearing or conference will advance the evaluation of the application.

(b) The Administrator may dismiss the application without prejudice If:

(1) he or she determines that there is insufficient information upon which to base a determination;

(2) upon his or her request, additional information is not submitted by the applicant or

(3) the applicant fails to provide the notice required by this sub-part

(c) Except as provided in this subpart, the Administrator will only consider an application for a waiver of preemption determination if:

(1) the applicant expressly acknowledges in its application that the highway routing designation of the State political subdivision thereof, or Indian tribe for which the determination is sought is preempted by the Act or the regulations thereunder; or

(2) the highway routing designation of the State, political subdivision thereof, or Indian tribe has been determined by a court of competent jurisdiction or in a determination issued pursuant to § 397.211 to be preempted by the Act or the regulations issued thereunder.

(d) When the Administrator has received all substantive information necessary to process an application for a waiver of preemption determination, notice of that fact will be served upon the applicant. Additional notice to all other persons who received notice of the proceeding may be served by publishing a notice in the Federal Register.

§ 397.219 Waiver determination and order.

(a) Upon consideration of the application and other relevant information received or obtained during the proceeding, the Administrator issues an order setting forth his or her determination.

(b) The Administrator may issue a waiver of preemption order only if he or she finds that the requirement of the State, political subdivision thereof, or Indian tribe affords the public a level of safety at least equal to that afforded by the requirements of the Act and the regulations issued under the Act and does not unreasonably burden commerce. In determining whether the requirement of the State, political subdivision thereof, or Indian tribe unreasonably burdens commerce, the Administrator may consider the following factors:

(1) The extent to which increased costs and impairment of efficiency result from the highway routing designation of the State, political subdivision thereof, or Indian tribe

(2) Whether the highway routing designation of the State, political subdivision thereof or Indian tribe has a rational basis;

(3) Whether the highway routing designation of the State, political subdivision thereof, or Indian tribe achieves its stated purpose; and

(4) Whether there is need for uniformity with regard to the subject concerned and if so, whether the highway routing designation of the State, political subdivision thereof, or Indian tribe competes or conflicts with those of other States, political subdivisions thereof, or Indian tribes.

(c) The order includes a written statement setting forth the relevant facts and the legal basis for the determination, and provides that any person aggrieved by the order may file a petition for reconsideration in accordance with § 397.223.

(d) The Administrator serves a copy of the order upon the applicant, any other person who participated in the proceeding and upon any other person readily identifiable by the Administrator as one who may be affected by the order. A copy of each order is placed on file in the public docket. The Administrator may publish the order or notice of the order in the Federal Register.

(e) If no petition for reconsideration is filed within 20 days in accordance with § 397.223, an order issued under this section constitutes the final agency decision regarding whether a particular requirement of a State, political subdivision thereof, or Indian tribe is preempted under the Act or any regulations issued thereunder, or whether preemption is waived.

§ 397.221 Timeliness.

If the Administrator fails to take action on the application within 90 days of serving the notice required by § 397.217(d), the applicant may treat the application as having been denied in all respects.

§ 397.223 Petition for reconsideration.

(a) Any person aggrieved by an order issued under § 397.211 or § 397.219 may file a petition for reconsideration with the Administrator. The petition must be filed within 20 days of service of the determination or order issued under the above sections.

(b) The petition must contain a concise statement of the basis for seeking reconsideration, including any specific factual or legal errors, or material information not previously available.

(c) The petitioner shall mail a copy of the petition to each person who participated, either as an applicant or routing, in the waiver of preemption proceeding, accompanied by a statement that the person may submit comments concerning the petition to the Administrator within 20 days. The petition filed with the

Administrator must contain a certification that the petitioner has complied with this paragraph and include the names and addresses of all persons to whom a copy of the petition was sent.

(d) The Administrator's decision under this section constitutes the final agency decision. If no petition for reconsideration is filed under this section, then the determination issued under § 397.211 or § 397.219 becomes the final agency decision at the end of the 20 day period.

§ 397.225 Judicial review.

A party to a proceeding under § 397.205(a), § 397.213(a), or § 397.223(a) may seek review by the appropriate district court of the United States of the decision of the Administrator under such proceeding only by filing a petition with such court within 60 days after the final agency decision.

Annex C CONSULTATIVE MEETING ROSTER

Meeting Invitees:

Jerritt S. Mortensen
RayChem Corporation

Albert Baietti
American Nuclear Society

C.L. Wisham, Manager
Nuclear Material Accountability
General Atomics

Karen Rasmussen
Director of Policy
California Trucking Association

Christopher Groff, Plant Eng. Dir.
Diablo Canyon Power Plant
Pacific Gas & Electric

Liz Allen
California Hazardous Materials Chair
Sierra Club

Richard R. Rosenblum, Vice President
Nuclear Eng. and Technical Support
Southern California Edison

Don Benninghoven
Executive Director
League of California Cities

Edward G. Valdez
National Semiconductor

Ethel DeMarr
Executive Director
Arizona Emerg Response Commission

James F. Clouser
President & CEO
SteriGenics

Larry Lunz, Chief
Research Division
Nevada Dept. of Transportation

Michael W. Kirkland, Sr. Specialist
Licensing & Traffic
General Electric Nuclear Energy

Ken Niles, Safety Analyst
Oregon/Hanford Transport
Oregon Department of Energy

Steve Redeker, Manager
Nuclear Plant Closure
Rancho Seco Nuclear Gen Facility

Alan Pasternak, Ph.D.
Technical Director
Calif. Radioactive Mgmt Forum

Mark Abkowitz, Ph.D., President
Abkowitz & Associates
Vanderbilt University

David J. Krueger
Southern California Chapter
Health Physics Society

John Sweeten, Director
Department Intergovt. Affairs
San Diego County

Donna Goertzen
Braunkhole Transport

John Morrison, President
Nordion International, Inc.

Jeff Cooney, Asst. Director of Safety
Tri State Motor Transit

Candace Gregory
California Department of Forestry

Lioness Woodstock
Operations Manager
Triple K Transport

Ronny Coleman
State Fire Marshal

Chris Meyer, Supervisor
Defense Logistics Agency
McClellen AFB

John Turner, Chief
Environmental Services Division
Department of Fish and Game

Glenn Beck, State Director
Federal Highway Administration

Gary Butner, Chief
Nuclear Emergency Response
Department of Health Services

Bobby H. Faulkenberry, Director
Nuclear Regulatory Commission,
Region V

Gerard Wong, PhD, Chief
Radiation Materials Control Section
Department of Health Services

Gary Callihan, HazMat Trans. Mgr.
San Francisco Operations Office
U.S. Department of Energy

Dale Ten-Brock, Chief
Office of Emergency Management
Department of Transportation

Terry Brubaker, Chief (H-8-3)
Emergency Response Section
U.S. EPA - Region 9

Richard Osborne, Chief
Radiological Defense Section
Office of Emergency Services

Richard C. Powers, Chief
Radiological Programs Division
Office of Emergency Services

Meeting Attendants:

Bob Lorenz
Pacific Gas & Electric

Barry Fairand, Ph. D.
Vice-President Tech/QA
SteriGenics

Michael W. Kirkland, Sr. Specialist
Licensing & Traffic
General Electric Nuclear Energy

Eric Golden, Ph.D.
Nuclear Engineering & Tech. Support
Southern California Edison

Baysul Parker
California Trucking Association

David J. Krueger
Southern California Chapter
Health Physics Society

Frank Zeitlhofer,
Dist. Supervisor
Nordion International, Inc.

Mr. Ed Bailey, Chief
Radiologic Health Branch
Department of Health Services

Tim F. Plaza, Asst. Chief
Office of Emergency Management
Department of Transportation

Richard Osborne, Chief
Radiological Defense Section
Office of Emergency Services

Bobbie Walton, Radiological Coord.
Radiological Defense Section
Office of Emergency Services

Bruce Paul, Operations Manager
Braunkohle Transport

Lloyd Rue
Safety and Traffic Engineer
Federal Highway Administration

Gary Callihan, HazMat Trans. Mgr.
San Francisco Operations Office
U.S. Department of Energy

Byron M. Stone, Representative
Office of Motor Carrier
Federal Highway Administration

Mickael Gouweloos, Representative
Office of Motor Carrier
Federal Highway Administration

Larry Lunz, Chief
Research Division
Nevada Dept of Transportation

Mark Lepofsky, Vice President
Product Development
Vanderbilt University, AAI

Joe Stirling
Regulations Affairs Specialist
Nordion International, Inc.

Gerard Wong, Ph.D., Chief
Radiation Materials Control Section
Department of Health Services

Michael Goshern, Lieutenant
Hazardous Materials Section
California Highway Patrol

Harry Kallabis, Sergeant
Hazardous Materials Section
California Highway Patrol

Kevin Livingston, Traffic Officer
Hazardous Materials Section
California Highway Patrol

Fran Schurer, Associate Analyst
Hazardous Materials Section
California Highway Patrol

Annex D ROUTES CLOSED TO HAZARDOUS MATERIALS TRANSPORTATION

Highways Restricted to the Through Transportation of Hazardous Materials/Waste:

Pursuant to Section 31306 of the California Vehicle Code (CVC), the following highways are restricted or prohibited to the through transportation of hazardous materials and hazardous waste for which the display of placards or markings is required by 27903 CVC. These highways are within the watershed of drinking water reservoirs/resources and meet the specified criteria in 31304 CVC. These restrictions or prohibitions do not eliminate necessary access for local pickup or delivery points consistent with safe vehicle operation.

Alameda County

State Route 84 From SR 238 (Mission Blvd.) through Niles Canyon to I-680. (Restricted by California Highway Patrol administrative procedure, September 24, 1989)

Contra Costa County

San Pablo Dam Road From Castro Ranch Road (City of El Sobrante) to Bear Creek Road/Wild Cat Canyon Road (City of Orinda). (Restricted by Contra Costa County Board of Supervisors Traffic Resolution #3225, March 29, 1988)

Bear Creek Road From Alhambra Valley Road to the city limits of Orinda. (Restricted by Contra Costa County Board of Supervisors Traffic Resolution #3225, March 29, 1988)

Santa Barbara County

State Route 154 From US 101 (Santa Barbara city limits) to SR 246 (near Santa Ynez). (Hazardous waste restriction only, by California Highway Patrol administrative procedure, March 21, 1986)

Lake County

State Route 20 From SR 53 to SR 29 (near the town of Upper Lake). (Restricted by California Highway Patrol administrative procedure, October 15, 1992)

Annex E PROPOSED REGULATIONS

Notice of Proposed Regulatory Action

Title 13. DEPARTMENT OF CALIFORNIA HIGHWAY PATROL

NOTICE OF PROPOSED REGULATORY ACTION

Designation of Routes for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials (HMS-94-01)

The California Highway Patrol proposes to adopt regulations in Title 13 of the California Code of Regulations relating to the designation of routes for the through transportation of highway route controlled quantity shipments of radioactive materials.

INFORMATIVE DIGEST

Section 33000 of the California Vehicle Code mandates the California Highway Patrol to adopt regulations necessary to implement the routing of highway route controlled quantity shipments of radioactive materials.

These regulations contain maps identifying preferred routes for the transportation of highway route controlled quantity shipments of radioactive materials pursuant to Section 33000 of the California Vehicle Code.

OVERVIEW OF FEDERAL AND STATE ROUTING REQUIREMENTS FOR HIGHWAY ROUTE CONTROLLED QUANTITY SHIPMENTS OF RADIOACTIVE MATERIALS

The United States Department of Transportation has established specific highway routing requirements for highway route controlled quantity shipments of radioactive materials. These requirements are codified in Title 49, Code of Federal Regulations, Section 177.825(b), which states:

> (b) ...a carrier or any person operating a motor vehicle containing a highway route controlled quantity of radioactive materials...shall operate the motor vehicle only over preferred routes...selected...to reduce time in transit...
>
> (1) A preferred route is either or both an Interstate System highway for which an alternative route is not designated by a

State routing agency...or a State designated route selected by a State routing agency...in accordance with the following conditions:

(i) The State routing agency shall select routes to minimize radiological risk using "Guidelines for selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Class 7 Radioactive Materials," or an equivalent routing analysis which adequately considers overall risk to the public....

(ii) State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways....

Title 49, Code of Federal Regulations, Section 177.825(b), provides authority for a state routing agency to "designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways" for the transportation of highway route controlled quantity shipments of radioactive materials. In addition, designations of alternate preferred routes must be proceeded by substantive consultation with affected local jurisdictions and with any other affected states to ensure consideration of all impacts and continuity of designated routes.

Title 49, Code of Federal Regulations, Section 177.825(b)(2), provide conditions when motor vehicles may be operated over a route, other than a preferred route while transporting highway route controlled quantity shipments of radioactive materials. Deviation from the preferred route may occur for the following:

- necessary pickup and delivery
- necessary rest, fuel or motor vehicle repair stops
- emergency conditions make continued use of the preferred route unsafe or impossible.

The responsibility for highway routing of hazardous materials, including Class 7 radioactive materials and the related preemption determination and waiver of preemption procedures, has been delegated by the Secretary of Transportation to the Federal Highway Administration. The Federal Highway Administration incorporated, without substantive change, Research and Special Programs Administration's regulations in Title 49, Code of Federal Regulation,

Sections 107.201 to 102.227, and 177.825 into the Federal Highway's regulations in Title 49, Code of Federal Regulation, Part 397, subpart D and E, respectively.

Section 33000, California Vehicle Code requires the California Highway Patrol to adopt regulations designating routes for the transportation of highway route controlled quantity shipments of radioactive materials.

PUBLIC COMMENTS

Any interested person may submit written comments on the proposed action to:

California Highway Patrol
Hazardous Material Section
ATTN: Routing and Prenotification Unit
P.O. Box 942898
Sacramento, CA 94298-0001

Written comments will be accepted until 4:45 p.m., March 14, 1994.

PUBLIC HEARINGS

No public hearings have been scheduled. Hearings will be scheduled in March and April 1994 based on requests received. If any person desires a public hearing, a written request must be received by the California Highway Patrol, Hazardous Materials Section, at the address listed below, no later than 15 days prior to the close of the written comment period.

California Highway Patrol
Hazardous Material Section
ATTN: Routing and Prenotification Unit
P.O. Box 942898
Sacramento, CA 94298-0001

AVAILABILITY OF INFORMATION

The California Highway Patrol has available for public review a general statement of reasons for the proposed regulatory action, the information upon which this action is based, and the proposed regulation. Requests to review or receive copies of this information should be directed to the California Highway Patrol, Hazardous Material Section by telephone at (916) 327-3310, by facsimile at (916) 446-4870, or by writing to:

California Highway Patrol
Hazardous Material Section
ATTN: Routing and Prenotification Unit
P.O. Box 942898
Sacramento, CA 94298-0001

Facismile or written requests for information must include the following information: the title of the rulemaking package, the requestor's name, proper mailing address (including city, state, and zip code), and a daytime telephone number in case the information is incomplete or illegible.

The "Radioactive Materials Transportation Routing Study - Designation of Routes for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials" is available for public review at each California Highway Patrol Division Office, and the California Highway Patrol Hazardous Materials Section, 444 North Third Street, Suite 310, Sacramento, CA.

QUESTIONS

Any questions concerning the contents of the proposed regulations should be directed to Sergeant Harry Kallabis or Officer Kevin Livingston, California Highway Patrol, Hazardous Material Section, at (916) 327-3310.

ADOPTION OF PROPOSED REGULATIONS

After consideration of public comments, the California Highway Patrol may adopt the proposal substantially as set forth without further notice. If the proposal is modified prior to adoption and the change is not solely grammatical or nonsubstantive in nature, the full text of the resulting regulation, with the changes clearly indicated, will be made available to the public for at least 15 days prior to the date of adoption.

FISCAL IMPACT

The California Highway Patrol has determined that this proposed regulatory action: (1) will have no affect on housing costs; (2) will not impose any new mandate upon local agencies or school districts; (3) involves no increased nondiscretionary or reimbursable costs or savings to any local agency, school district, state agency or federal funding to the State; (4) will not have an adverse economic impact on small business; and (5) will not result in any significant cost to private persons or entities.

ALTERNATIVES

The following statement is required pursuant to Government Code Section 11346.5(a)(7): "The California Highway Patrol must determine that no alternative considered by the California Highway Patrol would be more effective and less burdensome to affected private persons than the proposed action."

AUTHORITY

This regulatory action is being taken pursuant to The California Vehicle Code Section 33000.

Date: January 4, 1994

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL

L. DENNO, Chief
Enforcement Services Division

File #: HMS-94-01
66.A9614\hms94-01\notice

Initial Statement of Reasons

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL

INITIAL STATEMENT OF REASONS - January 1994

Designation of Routes for the Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials (HMS-94-01)

Pursuant to Section 33000 of the California Vehicle Code, the Department of California Highway Patrol is establishing route designations for the through transportation of highway route controlled quantity shipments of radioactive materials. The federal government has established all interstate highways as approved routes; the Department of California Highway Patrol is proposing to designate only those routes necessary for through transportation.

PURPOSE OF REGULATIONS

Section 33000 of the California Vehicle Code mandates the California Highway Patrol to adopt regulations necessary to implement the routing of highway route controlled quantity shipments of radioactive materials.

The regulations contain maps identifying preferred routes for the transportation of highway route controlled quantity shipments of radioactive materials pursuant to Section 33000 of the California Vehicle Code.

LEGISLATIVE HISTORY

1959 Sections 33000 and 33001 were added to the California Vehicle Code in September 1959. Section 33000 defined "Radioactive Materials" for the purposes of the California Vehicle Code. Section 33001 provided that the State Fire Marshal may adopt regulations that may promote the safe transportation of radioactive materials.

1961 In September 1961, Section 25651 was added to the Health & Safety Code. This Section provided that the California Department of Health Services shall adopt regulations to promote the safe transportation of radioactive materials. The Section also included a provision that the regulations may include routes. Section 33000, California Vehicle Code was amended to require that the transportation of radioactive material comply with the provisions of the Health & Safety Code. Section 33001, California Vehicle

Code relating to the State Fire Marshal's authority to adopt radioactive material regulations was repealed.

1981 In January 1981, Section 33000, California Vehicle Code and Section 25651, Health and Safety Code were amended. These Sections provided that the California Highway Patrol shall adopt regulations specifying the routes to be used for the transportation of hazardous radioactive materials, as such materials are defined in regulations of the California Department of Health Services.

1991 In January of 1991, the California Department of Health Services amended Title 17, Section 30100, California Code of Regulations defining "hazardous radioactive material" as "highway route controlled quantity" of radioactive materials, as defined in Title 49, Section 173.403, Code of Federal Regulations.

DEFINITIONS

- "Highway Route Controlled Quantity" - Defined in Title 49, Section 173.403, Code of Federal Regulations as a quantity within a single package which exceeds:

  (1) 3000 times the A_1 value of the radionuclides as specified in Section 173.433 for special form radioactive material;

  (2) 3000 times the A_2 value of the radionuclides as specified in Section 173.433 for normal form radioactive material; or

  (3) 30,000 curies, whichever is least.

The following definitions are abstracted from Title 49, Part 173, Code of Federal Regulations:

- A_1 - The maximum activity of special form radioactive material permitted in a Type A package.

- A_2 - The maximum activity of radioactive material, other than special form or low specific activity radioactive material, permitted in a Type A package. These A_1 and A_2 values are either listed in Section 173.435 or may be derived in accordance with the procedure prescribed in Section 173.433.

- Special Form - Radioactive material that is prepackaged or encapsulated in a special form capsule that can only be opened by destroying the capsule. The criteria for a material meeting the definition of special form are found in Section 173.469, Special Tests. Tests include impact, percussion, bending, heating, leaching, and immersion. A complete certification and supporting safety analysis must be available and on file by each shipper in compliance with Section 173.476.

- Normal Form - Radioactive materials that are not in special form are called normal form. Normal form materials are described in terms of physical form (solid, gas, powder, liquid, etc.) and chemical form (organic salt, nitrite, chloride, sludge, etc.).

- Type A Package - A Type A package defined as its packaging together with its limited radioactive contents. Type A package contents are limited to A_1 or A_2.

- Type A Packaging - A packaging designed to retain the integrity of containment and shielding required by this part under normal conditions of transported as demonstrated by the tests set forth in Sections 173.465 or 173.466, as appropriate. Tests include: water spray (for 1 hour to simulate rainfall of 2 inches per hour), free drop (free fall onto a flat hard surface with distance specified according to packaging weight), compression (5 times the weight of the package for at least 24 hours), and penetration (impact from dropping a 13 pound bar (1-1/4 inch in diameter) vertically from a height of 3.3 feet). Each shipper of a Type A package is required to maintain on file a complete documentation of tests and supporting safety analysis that the construction methods, packaging design, and materials of construction are in compliance with the specifications.

- Type B Package - A Type B package is defined as its packaging together with its radioactive contents.

- Type B Packaging - A packaging designed to retain the integrity of containment and shielding required by this part when subjected to normal conditions or transport and hypothetical accident test conditions set forth in Title 10, Code of Federal Regulations, Part 71. This package must meet all Type A criteria and requirements plus provide adequate protection for serious accident conditions with limited loss of shielding and no loss of containment. The series of accident test requirements include: water immersion (under 15 meters for not less than 8 hours), free drop (from 30 feet onto a flat unyielding surface), puncture (a free drop of 40 inches

onto a 6 inch diameter cylindrical steel bar), and thermal test (30 minutes at 1475°F). Only Type B packaging is used for highway route controlled quantity shipments.

OVERVIEW OF FEDERAL AND STATE GENERAL ROUTING REQUIREMENTS

Overall authority to regulate the highway movement of hazardous materials is vested in the Federal Government through the Hazardous Materials Transportation Act of 1975, as amended by the Hazardous Materials Transportation Uniform Safety Act of 1990. The Hazardous Materials Transportation Act, as amended, requires the Secretary of the United States Department of Transportation, Research and Special Programs Administration, to issue regulations applicable to interstate, intrastate and foreign commerce. The United States Department of Transportation is the administering agency for the Secretary, and as such promulgates hazardous materials regulations.

State and local governments may also regulate hazardous materials, but only to the extent that they make no regulations which conflict with or are inconsistent with a federal regulation.

Section 13 of the Hazardous Materials Transportation Uniform Safety Act amended the statutory preemption authority under Section 112 of the Hazardous Materials Transportation Act (49 United States Code app. 1811) to provide that any requirement of a state or political subdivision is preempted if:

(1) compliance with both the state or political subdivision requirement and the Hazardous Materials Transportation Act, as amended, or the regulations adopted thereunder is not possible; or

(2) the state or political subdivision requirement is an obstacle to the accomplishment and execution of the Hazardous Materials Transportation Act, as amended, or its regulations.

Since 1977, the United States Department of Transportation has issued over 32 inconsistency rulings (with the Hazardous Materials Transportation Act, as amended, these become preemption determinations) concerning regulations of municipalities, county governments, states, and other government agencies such as bridge, tunnel and turnpike authorities.

Notwithstanding the preemption of a state or local requirement, the Hazardous Materials Transportation Act, as amended, provides that the United States Department of Transportation may waive preemption upon a showing by the

jurisdiction that its requirements afford an equal or greater level of protection to the public than is afforded by the federal requirements and its requirements do not unreasonably burden commerce.

The Federal highway routing preemption "General Rule" in Section 105 of the Hazardous Materials Transportation Act (49 United States Code app. 1804) as amended by Section 4 of the Hazardous Materials Transportation Uniform Safety Act, states that no state may establish, maintain, or enforce:

(1) any highway route designation over which hazardous materials may or may not be transported by motor vehicle, or

(2) any limitation or requirement with respect to such routing, unless such designation, limitation, or requirement is made in accordance with the procedural requirements of the Federal Standards and complies with the substantive requirements of the Federal Standards.

Regarding California's requirements for hazardous materials transportation, concern for the proper disposal and transportation of hazardous waste led to enactment of Section 31303, California Vehicle Code in 1984. This Section established the general routing requirement of using the most direct route utilizing state or interstate highways wherever possible. This Section also included a mechanism for the California Highway Patrol to prohibit hazardous waste transportation on designated highways when a safer alternative could be established using specific guidelines set forth in Section 31304.

Effective January 1, 1987, Section 31303, California Vehicle Code was amended to require all vehicles required to be placarded or marked in accordance with Section 27903, California Vehicle Code (other than those subject to more specific requirements such as certain shipments of explosives, inhalation hazards and radioactive materials) to comply with the general routing requirements. Further, the route selection criteria was changed to require use of interstate or state highways offering the least overall transit time whenever practicable.

OVERVIEW OF FEDERAL AND STATE ROUTING REQUIREMENTS FOR HIGHWAY ROUTE CONTROLLED QUANTITY SHIPMENTS OF RADIOACTIVE MATERIALS

The United States Department of Transportation has established specific highway routing requirements for highway route controlled quantity shipments of radioactive materials. These requirements are codified in Title 49, Code of Federal Regulations, Section 177.825(b), which states:

(b) ...a carrier or any person operating a motor vehicle containing a highway route controlled quantity of radioactive materials...shall operate the motor vehicle only over preferred routes...selected...to reduce time in transit...

(1) A preferred route is either or both an Interstate System highway for which an alternative route is not designated by a State routing agency...or a State designated route selected by a State routing agency...in accordance with the following conditions:

(i) The State routing agency shall select routes to minimize radiological risk using "Guidelines for selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Class 7 Radioactive Materials," or an equivalent routing analysis which adequately considers overall risk to the public....

(ii) State routing agencies may designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways....

Title 49, Code of Federal Regulations, Section 177.825(b), provides authority for a state routing agency to "designate preferred routes as an alternative to, or in addition to, one or more Interstate System highways" for the transportation of highway route controlled quantity shipments of radioactive materials. In addition, designations of alternate preferred routes must be proceeded by substantive consultation with affected local jurisdictions and with any other affected states to ensure consideration of all impacts and continuity of designated routes.

Title 49, Code of Federal Regulations, Section 177.825(b)(2), provide conditions when motor vehicles may be operated over a route, other than a preferred route while transporting highway route controlled quantity shipments of radioactive materials. Deviation from the preferred route may occur for the following:

- necessary pickup and delivery
- necessary rest, fuel or motor vehicle repair stops
- emergency conditions make continued use of the preferred route unsafe or impossible.

The responsibility for highway routing of hazardous materials, including Class 7 radioactive materials and the related preemption determination and waiver of preemption procedures, has been delegated by the Secretary of Transportation to the Federal Highway Administration. The Federal Highway Administration incorporated, without substantive change, Research and Special Programs Administration's regulations in Title 49, Code of Federal Regulation, Sections 107.201 to 102.227, and 177.825 into the Federal Highway's regulations in Title 49, Code of Federal Regulation, Part 397, subpart D and E, respectively.

Section 33000, California Vehicle Code requires the California Highway Patrol to adopt regulations designating routes for the transportation of highway route controlled quantity shipments of radioactive materials.

STUDIES/RELATED FACTS

1. Risk Assessment Methodology

The route risk assessments were conducted with consideration of existing federal and State routing requirements and in compliance with the United States Department of Transportation, Research and Special Programs Administration, "Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials" (DOT/RSPA/HMS/92-02, hereinafter referred to as the federal guidelines). Documentation of the methodology employed is contained in the California Highway Patrol's "Radioactive Materials Transportation Routing Study - Designation of Routes for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials."

- Federal Routing Guidelines:

  Primary Risk Factors - Federal guidelines emphasize that the route selection should be based on the risk which is associated with the radiological nature of the cargo. This approach results in the selection of routes that minimize the total impact associated with normal exposure and the potential consequences of an accidental release of radioactive materials. Consequently, the following are considered by the federal guidelines to be the primary route comparison factors:

  - Normal radiation exposure - Shipping packages containing radioactive materials emit radiation during transport. Sufficient shielding must be contained in the package to reduce

this radiation to safe levels as specified in Department of Transportation regulations. Exposure could vary significantly among available routes and should be considered during route selection.

- Public health risks from accidents - Highway route controlled quantity shipments contain amounts of radioactive materials that are potentially harmful to the public if released. For this reason, these materials may only be transported in shipping packages (approved by the United States Department of Transportation, the United States Department of Energy, or the Nuclear Regulatory Commission) designed to isolate the materials from the public, even in severe transportation accidents.

- Economic risk from accidents - A very severe transportation accident could also result in contamination of nearby property. The frequency of severe transportation accidents which could cause contamination must also be considered during route selection.

Secondary Risk Factors - Factors that are considered secondary to the basic goal of minimizing the radiological risk from transportation are identified below. These secondary factors may be considered if the route analysis reveals that alternative routes have essentially the same level of risk based on the three primary factors.

- Emergency response capabilities - If a severe transportation accident results in radioactive material being released from the shipping package, actions by emergency response personnel can mitigate the potential consequences from the release. These factors could vary significantly among available routes.

- Evacuation - One method of mitigating the consequences of a radioactive material release is to evacuate those who could potentially be exposed to the material. The time and effort required to evacuate a segment of the population may vary among the available routes. Evacuation is often ordered as a precautionary measure if an accident occurs, even if a release has not been confirmed. Evacuation has economic impacts which may also be considered in comparing available routes.

- Location of special facilities - Some private and public facilities along transportation routes contain populations requiring special consideration when analyzing the potential effects of accidental releases of radioactive materials or exposure during transport. The number and type of such facilities (i.e. stadiums, schools and hospitals, etc.), provide a basis for comparing alternative routes.

- Traffic fatalities and injuries - Trucks carrying radioactive materials may be involved in traffic accidents, just like other vehicles. Routes that minimize these accidents would be preferred.

The "primary" route risk comparison factors formed the basis for route selection. The secondary factors were not used because clear-cut choices emerged from the evaluation of the primary factors.

- Additional Routing Considerations:

The California Highway Patrol contemplated additional routing considerations such as physical constraints of roadways; inadequate shoulders, turning radius for commercial vehicle traffic; and height, weight, and/or width restrictions. Legal constraints for consideration include factors such as bridges, tunnels, toll crossings, or highway restricted to the through transportation of hazardous materials/waste by administrative action pursuant to Section 31304, California Vehicle Code.

Time of day and day of week considerations are deferred to federal regulation currently found in Title 49 Section 177.825 (b) (2), Code of Federal Regulations.

2. Survey: Highway Route Controlled Quantity Shipments of Radioactive Materials Transportation

- Purpose

To conduct the comparative risk analyses necessary to evaluate alternate routes, it was necessary to identify common points of origin and destination for highway route controlled quantity shipments of radioactive materials. No such database or flow study existed that identified these points in California.

All facilities using radioactive materials, except those exclusively licensed by the Nuclear Regulatory Commission, are required to be licensed by the California Department of Health Services. The California Department of Health Services issues a Radioactive Materials License to those qualified facilities. The California Highway Patrol obtained a mailing list for 2,253 radioactive materials licensees[1] and mailed a survey questionnaire to each licensee. The survey requested the licensee to answer six questions relating to the transportation of highway route controlled quantity shipments of radioactive materials. The questions were as follows:

1. Identify by name, any highway route controlled quantity shipments of radioactive materials transported or received.

2. Provide an annual estimate of highway route controlled quantity shipments, by name, transported or received.

3. Identify the nearest major highway intersection to your facility.

4. If highway route controlled quantity shipments leave your facility, identify the nearest major highway intersection to the shipment destination. If the shipment leaves California, identify the highway used.

5. Provide the name(s) and address for each carrier that transports or delivers highway route controlled quantity shipments to/from your facility.

6. Identify the time of day and day of week your facility sends and or receives highway route controlled quantity shipments.

- Survey Results:

The Hazardous Material Section received approximately 300 telephone calls and 130 completed questionnaires. Of the total responses received, seven licensees indicated they transported or received highway route controlled quantity shipments of radioactive materials.

[1]Licensees as of March 1993

The survey responses identified seven origin and destination points. Additional origin and destination points were identified through contacts with the California Department of Health Services, the Nuclear Regulatory Commission, the United States Department of Energy, and the Federal Highway Administration.

3. Interested Party Mailing List

Fifty-three licensees completing the "Highway Route Controlled Quantity Shipments of Radioactive Materials Survey" requested to be included on an interested party mailing list. The mailing list was further expanded to include: consultative meeting invitees; administering agencies; local emergency responders along the proposed routes; California Department of Transportation Districts; State Regional Offices of Emergency Services; and other interested government agencies and private parties requesting information.

4. HazTrans®

To complete the required route risk assessments on approximately 2,434 miles of California highways (Interstate routes), the California Highway Patrol used HazTrans®, a computer based route risk assessment program developed by Abkowitz and Associates, Inc. in association with Vanderbilt University. The California Highway Patrol entered into a contract with Vanderbilt University in 1989 to provide a California specific version of this software. The routing methodology incorporated into the HazTrans® program exceeds the criteria established in the federal guidelines.

The HazTrans® contract includes the maintenance of this California unique database. HazTrans® allows for conducting route risk assessments with consideration of the following routing criteria: population exposure, distance, travel time, accident likelihood, risk and radiological risk.

HazTrans® provides the State of California with a flexible and easy-to-use, yet comprehensive tool for evaluating risks and selecting preferred routes associated with the transportation of highway route controlled quantity shipments of radioactive material. HazTrans® consists of two major components, a mapping system and an analysis methodology, which are fully integrated.

- HazTrans® Databases/Sources

The databases contained in the California version of HazTrans® were derived from the most current sources available. The following provides a description of the California specific data that was used in completing the required route risk assessments:

Road Network - In addition to using the HazTrans® national road network for California, other segments have been included in the California system so that all Interstates, United States Routes, State Routes, and selected major county roads in the State of California are contained in the network, as well as points-of-entry from major routes of those states located adjacent to California.

Accident Rates and Accident Likelihood - Accident rates were derived from the California Department of Transportation, 1989 Route Segment Report, Volume 2. In that document, vehicle accident rates for each California highway segment are reported as a three-year historical average. This methodologically is desirable because it tends to smooth the effects of an unusual accident reporting year. These accident rates combine the likelihood of an accident with the likelihood of a release of the hazardous cargo given that an accident has occurred. Obviously, not all accidents will result in a release so that the release-causing accident rate will be somewhat lower than the vehicular accident rate. If truck accident rates were unavailable then accident rates were derived from those developed by the Federal Highway Administration for the different functional classifications that appear in the United States roadway network.

Travel Time - Travel times, also derived from the California Department of Transportation, 1989 Route Segment Report, Volume 2, are based on observed (rather than posted) operating speeds, and are converted to travel time based on the segment length. For county roads in California which were added to the system, if California Department of Transportation information was not available, HazTrans® national travel time and accident rate assumptions were used based on formulas adopted by the Federal Highway Administration and the American Association of State Highway Transportation Officials.

Segment Population - Exposure values were determined by overlaying the "block level" population statistics from the 1990 United States

Census onto the transportation networks and determining the population residing within each of the pre-defined bandwidths. The "block level" data is the most detailed population data available in a geographically referenced format.

Risk - The criteria for determining relative risk is defined by the federal routing criteria guidelines as:

$$RISK_{route} = \sum_{I=1}^{L} [P(Accident)_I \cdot P(Release) \cdot Consequence_I^{Risk\ Preference}]$$

where L is the number of segments (or links) in the route, $P(Accident)_I$ is the accident likelihood along segment I, $P(Release)$ is the likelihood that an accident will result in a release, $Consequence_I$ is the expected consequences of a release along segment I. Beyond representing the Federal definition of risk, HazTrans® risk models can also distinguish between technical and perceived risk. *Risk Preference* is used to represent the differences between public perception and technical judgement.

Radiological Risks - The risks associated with normal transport exposure and the public health risk involved with radioactive material shipments are used to calculate a relative radiological risk index.

- Normal Transport Exposure - Federal routing guidelines suggests that radiological risk associated with the normal transport of radioactive materials be computed by:

D	=	Dose to persons residing along the route	+	Dose to passengers in other vehicles	+	Dose to Truck crew	+	Dose to people at truck stops

Upon review of the California Highway Patrol "Risk Assessments for Transportation of Radioactive Materials on California's Highways (1989)" the "dose to passengers in other vehicles" component of the risk equation was found to zero out. HazTrans® computes the normal transport exposure risk as follows:

D	=	Dose to persons residing along the route	+	Dose to Truck crew	+	Dose to people at truck stops

In this calculation, HazTrans® used the length of the route, average speed of the vehicle along the route, and the average population density (in people per square mile within a five mile bandwidth) along the route.

- Public Health Risk - The frequency of release-causing accidents and the consequences of such a release are the criteria used to calculate the relative public health risk.

Public Health Risk	=	Frequency of Accident	x	Consequence measure

Consequence as defined by the federal routing guidelines are a measure of the exposed population computed by:

For rural segments:

Consequence measure	=	Population per square mile for a 0 to 5 mile bandwidth	x .75	+	Population per square mile for for a 5 to 10 mile bandwidth	x .25

For urban segments:

Consequence measure	=	Population per square mile for a 0 to 5 mile bandwidth	x 1.00

Normalized values of the normal transport exposure and public health risk are equally weighted to determine the radiological risk as follows:

Radiological Risk	=	Normal transport exposure risk bandwidth	x .5	+	Public health risk	x . 5

Emergency response - This information is currently identified in the HazTrans® system in terms of response times from California

Highway Patrol field offices to destinations along the proposed routes within the office's jurisdiction.

Routing analyses were conducted with consideration of both overall radiological risk factors and travel time. Routes with physical or legal constraints were eliminated from consideration. Special attention was given to the correlation between population exposure and realistic travel times for commerce. Each route analysis was conducted independently, examining each route alternate for the route offering an acceptable balance between radiological risk and transit time. When the route HazTrans® selected to maximize radiological risk was different from the route selected to maximize travel time, the route maximizing overall radiological risk reduction was selected.

Review, verification and validation of the route risk assessment methodology and analyses was conducted by staff and faculty of Vanderbilt University.

5. Consultative Meeting: Highway Route Controlled Quantity Shipments of Radioactive Materials

To assist with the implementation process requirements and provide a forum for the consultation suggested by the federal guidelines, a consultative meeting was held in August 1993. Representatives from the following organizations were invited to attend: radioactive material manufacturers and transporters, California health physicists, engineers and scientists, local government organizations, an environmental group, the California Department of Health Services, the California Department of Transportation, Govenor's Office of Emergency Services, Office of the State Fire Marshall, Federal Highway Administration, United States Department of Energy, Nuclear regulatory commission, Abkowitz and Associates, Inc., representatives from adjoining states, and any additional interested parties.

The purpose of the consultative meeting was two-fold:

(1) To encourage open communication and support for the development of routes by involving government and industry in the implementation process, and

(2) To consult with government and industry representatives to gain information necessary for the formulation of regulations and the designation of routes.

6. Environmental Impact Analysis

Environmental concerns are addressed as part of the Department's routing study.

The California Highway Patrol is proposing to adopt regulations to designate routes for the through transportation of highway route controlled quantity shipments of radioactive materials. The federal government has established all interstate highways as approved routes. The Department of California Highway Patrol is proposing to designate only those routes necessary for through transportation. The proposed regulations involve no expansion of the current preferred routing system for the shipment of radioactive materials.

In fact, the proposed routes for the through transportation of highway route controlled quantity shipments of radioactive materials will not create additional environmental hazards, but will mitigate and reduce risks already in existence. The Hazardous Materials Transportation Act, as amended, provides the federal government authority to designate routes for both inter- and intra-state transportation of hazardous materials. In the absence of specific state designated routes, transporters are required by federal regulations to use interstate highways. The adoption of these routes will cause no overall increase in highway route controlled quantity shipments of radioactive materials traffic; it will actually reduce highway route controlled quantity shipments of radioactive materials on routes which are not as safe as those proposed in this study.

The California Environmental Quality Act requires consideration of physical effects on the environment for actions such as the adoption of these proposed regulations. The California Highway Patrol has conducted an environmental review according to the California Environmental Quality Act and has determined that the proposed regulations meet the requirements for a categorical exemption under Class 1, Section 15301; and Class 8, Section 15308. In light of the above, the Department proposes to adopt such exemptions at the completion of the regulatory process. The Department's primary environmental consideration has been consistent with the intent of the federal guidelines, preservation of human life. Additionally, environmental factors were given appropriate consideration during the study.

7. Background Material

Documentation of the methodology employed in selecting the routes is contained in the California Highway Patrol's "Radioactive Materials Transportation Routing Study - Designation of Routes for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials." A copy is contained in the rulemaking file.

LOCAL MANDATE

These regulations do not impose a new mandate on local agencies or school districts.

IMPACT ON SMALL BUSINESS

For purposes of these regulations, small businesses are not singled out, or identified, from large businesses. These regulations affect all transporters of Highway Route Controlled Quantity Shipments of Radioactive Materials and it is assumed that both small and large businesses are included in this group. Therefore, The Department has not identified any significant impact on small business.

ALTERNATIVES

The California Highway Patrol has not identified any alternative that would be more effective in carrying out the purpose for which this action is proposed or would be as effective and less burdensome to affected persons than the proposed action.

ECONOMIC IMPACT

The Department has determined that these regulations will result in:

- No significant compliance costs for persons or businesses directly affected.
- No discernible impact on the level and distribution of costs and prices for large and small businesses.
- No impact on the level of employment in the state.

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Title 13 - California Code of Regulations

Chapter 6. Hazardous Materials

Article 2.7. Routes for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials

§ 1158. Applicability.

(a) This article designates the through routes to be used for the transportation of highway route controlled quantity shipments of radioactive materials subject to Section 33000 of the Vehicle Code.

(b) This article shall apply to the transportation of ***highway route controlled quantity shipments*** of radioactive materials as defined in Title 49, Code of Federal Regulations, Section 173.403 (1).

Note: Authority cited: Section 33000, Vehicle Code.

§ 1158.1. Designation of Routes.

The highways to be used for transportation of commodities listed in Section 1158 are set forth in Section 1159.

Note: Authority cited: Section 33000, Vehicle Code.

§ 1158.2. Routes Travelled and Stopping.

No person shall drive or permit the driving of any vehicle transporting commodities listed in Section 1158 upon any highway not designated by this article. Deviation from the routes may occur only for the following: necessary pickup and delivery, in route inspections as required by Federal law, necessary rest, fuel or motor vehicle repair stops, or as directed in an emergency by fire or police officials having jurisdiction of the roadway in use.

Note: Authority cited: Section 33000, Vehicle Code.

§ 1158.3. Time of Day and Day of Week Considerations.

Time of day and day of week considerations are deferred to federal regulation currently found in Title 49 Section 177.825 (b) (2), Code of Federal Regulations.

§ 1159. Routes

(a) Narrative listing of routes.

(1) Interstate Highway 5: From the State of Oregon border to Interstate Highway 210 and from Interstate Highway 605 to Interstate Highway 805 and from the border of Mexico to Interstate Highway 805.

(2) Interstate Highway 8: From the State of Arizona border to Interstate Highway 805.

(3) Interstate Highway 10: From the State of Arizona border to Interstate Highway 605.

(4) Interstate Highway 15: From the State of Arizona border to Interstate Highway 8.

(5) Interstate Highway 40: From the State of Arizona border to Interstate Highway 15.

(6) Interstate Highway 80: From the State of Nevada border to Interstate Highway 580

(7) Interstate Highway 205: From Interstate Highway 5 to Interstate Highway 580.

(8) Interstate Highway 210: From Interstate Highway 5 to Interstate Highway 10.

(9) Interstate Highway 238: From Interstate Highway 580 to Interstate Highway 880.

(10) Interstate Highway 280: From Interstate Highway 680 to Interstate Highway 380.

(11) Interstate Highway 580: From Interstate Highway 5 to Interstate Highway 680.

(12) Interstate Highway 605: From Interstate Highway 210 to Interstate Highway 5.

(13) Interstate Highway 680: From Interstate Highway 80 to Interstate Highway 280.

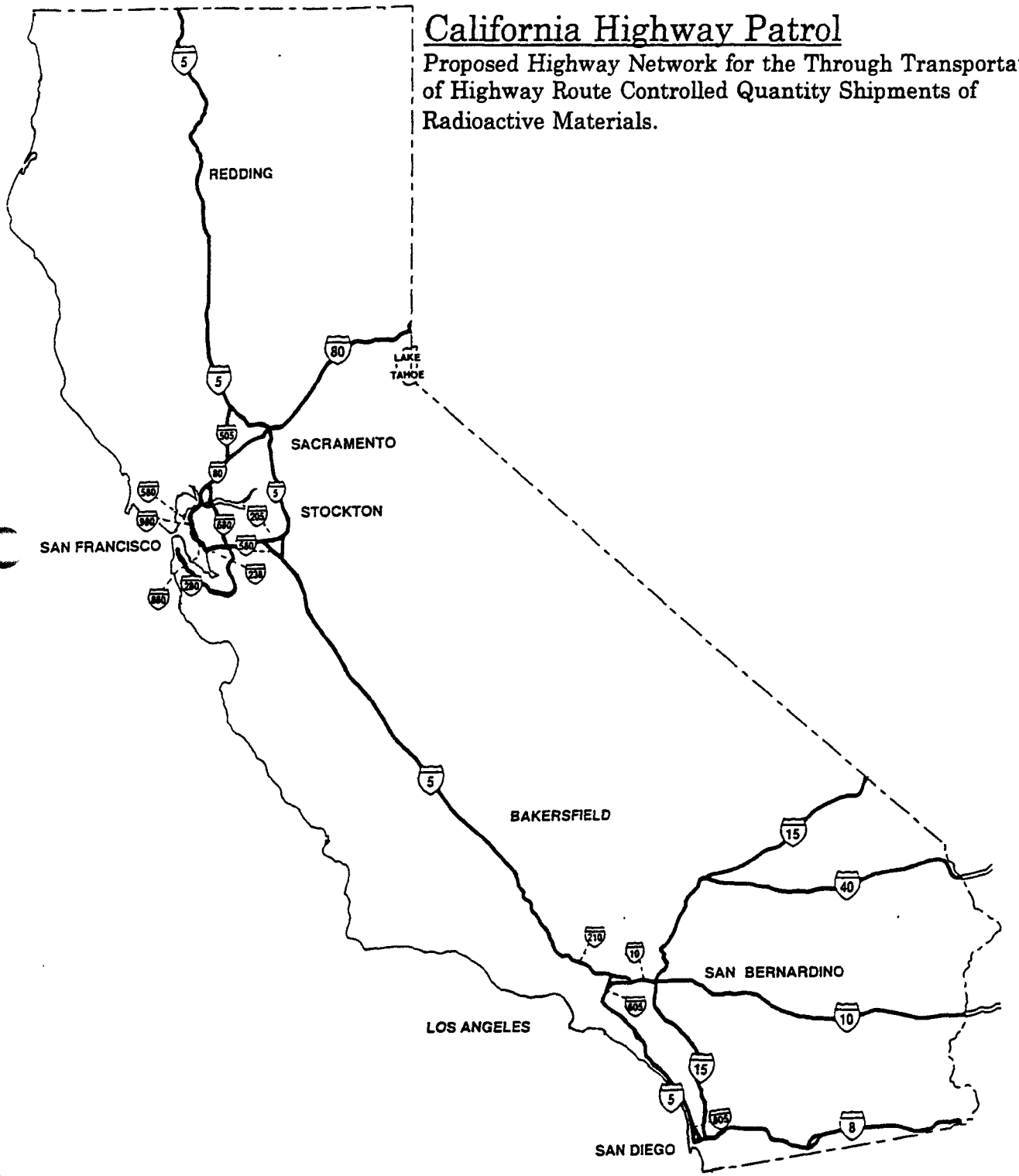
(14) Interstate Highway 805: From Interstate Highway 5 (north of the City of San Diego) to Interstate Highway 5 (south of the City of San Diego).

(15) Interstate Highway 880: From Interstate Highway 980 to Interstate Highway 238.

(16) Interstate Highway 980: From Interstate Highway 580 to Interstate Highway 880.

Note: Authority cited: Section 33000, Vehicle Code.

(b) Route Map


California Highway Patrol
Proposed Highway Network for the Through Transportation of Highway Route Controlled Quantity Shipments of Radioactive Materials.
REDDING
LAKE TAHOE
SACRAMENTO
STOCKTON
SAN FRANCISCO
BAKERSFIELD
SAN BERNARDINO
LOS ANGELES
SAN DIEGO